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PRELIMINARY

TECHNICAL MANUAL AND OPERATOR'S HANDBOOK

for

ANTENNA COUPLER GROUP AN/SRA-56, -57, -58

DEPARTMENT OF THE NAVY
NAVAL SHIP SYSTEMS COMMAND

This is a preliminary manual for AN/SRA-56, AN/SRA-57 and AN/SRA-58 technical manual, publication number NAVSHIPS 0967-284-6010, and operator's handbook, Section 3, publication number NAVSHIPS 0967-284-6020 supplied under contract no. NObsr-95359. The final manual will consist of 2 volumes, Volume I technical manual (NAVSHIPS 0967-284-6010) and Volume II operator's handbook (NAVSHIPS 0967-284-6020). The 2 volumes are bound as one in the preliminary by direction of the Navy Department. In order to receive a copy of the final technical manual and operator's handbook, you must return this card IMMEDIATELY, indicating your ship or shore activity and mailing address in the space below.

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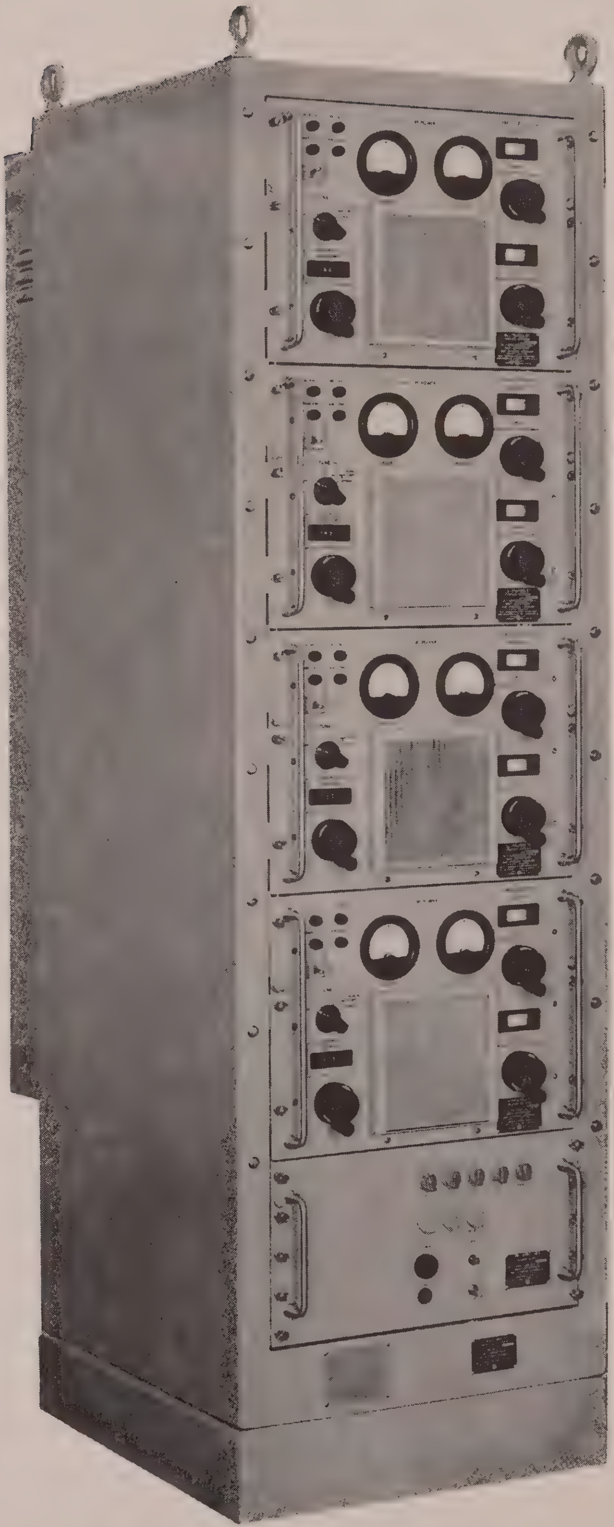

Figure 1-1. Antenna Coupler Group AN/SRA-56, AN/SRA-57 or AN/SRA-58

SECTION 1

GENERAL INFORMATION

1.1 SCOPE

Technical manual NAVSHIPS 0967-284-6010 covers the description, installation, troubleshooting, maintenance, and parts list for Antenna Coupler Groups AN/SRA-56, AN/SRA-57, and AN/SRA-58. Operating procedures for these equipments are bound separately as NAVSHIPS 0967-284-6020.

Technical manual NAVSHIPS 0967-284-6010 is in effect upon receipt and does not supersede any other manual. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

1.2 GENERAL DESCRIPTION

Antenna Coupler Groups AN/SRA-56, -57, and -58 are designed primarily for shipboard use. Each antenna coupler group permits several transmitters to operate simultaneously into a single, associated, broadband antenna, thus reducing the total number of antennas required in the limited space aboard ship.

In particular, these antenna coupler groups provide: (1) a coupling path of prescribed efficiency between each transmitter and the associated antenna; (2) isolation between transmitters; (3) tunable bandpass filters to suppress harmonic and spurious transmitter outputs; and (4) line-flattening to transform antenna voltage standing wave ratios (vswr) as high as 3-to-1 to a 1.05-to-1 (or less) vswr load for the transmitter.

The three antenna coupler groups (figure 1-1) are similar in appearance and function, except for the different frequency ranges in which they operate and the capability of providing four-channel or eight-channel configurations. Antenna Coupler Group AN/SRA-56 operates in the nominal frequency range from 2 to 6 megacycles; Antenna Coupler Group AN/SRA-57, in the range from 4 to 12 megacycles; and Antenna Coupler Group AN/SRA-58, in the range from 10 to 30 megacycles. Antenna Coupler Groups AN/SRA-56 or -57 can each be operated alone in a four-channel configuration, or two of the same antenna coupler groups can be combined by means of an impedance matching network to form an eight-channel configuration; Antenna Coupler Group AN/SRA-58 can only be used in a four-channel configuration.

A single antenna coupler group consists of four antenna couplers (channels), built as drawer assemblies and installed in an electrical equipment cabinet, and a power supply installed in the bottom position of the cabinet. The antenna coupler groups are modular in design. All antenna coupler drawers are interchangeable within the same antenna coupler group; the power supply assemblies and many of the subassemblies and components in the equipment cabinets and in the antenna coupler drawers are interchangeable within all three coupler groups. Each antenna coupler group is a self-contained unit having all required rf circuits; operational controls; monitoring, control, and protective circuits; and power distributions and supply circuits housed within the electrical equipment cabinet.

Each antenna coupler group or eight-channel configuration operates with a separate broadband antenna having a maximum vswr of 3-to-1 over the nominal frequency range of the associated antenna coupler group. The antenna coupler groups can operate with transmitters having power outputs as high as 1 kilowatt average and 2 kilowatts peak envelope power for each channel, and as low as 500 watts average per channel. Any individual antenna coupler within a coupler group may be operated at any frequency within its tuning range, provided that it does not operate within 5 percent of the frequency occupied by another antenna coupler within the same coupler group.

Note

> Power levels less than 500 watts may be used, but no overload protection is provided for the transmitter and the input vswr may exceed 1.05 to 1.

1.3 COMMON NAMES

Table 1-1 lists the common names assigned to the major units to eliminate unnecessary repetition of AN nomenclature. Formal nomenclature is used where required to distinguish between the three antenna coupler groups covered by this manual.

TABLE 1-1. COMMON NAMES

NOMENCLATURE		
NAME	DESIGNATION	COMMON NAME
Antenna Coupler Group	AN/SRA-56 AN/SRA-57 AN/SRA-58	coupler group
Antenna Coupler	CU-1772/SRA-56 CU-1774/SRA-57 CU-1776/SRA-58	antenna coupler, channel, or coupler drawer
Power Supply	PP-4993/SRA	power supply panel
Electrical Equipment Cabinet	CY-6422/SRA-56 CY-6423/SRA-57 CY-6424/SRA-58	equipment cabinet
Impedance Matching Network	CU-1773/SRA-56 CU-1775/SRA-57	matching network

1.4 DESCRIPTION OF UNITS

Antenna Coupler Group AN/SRA-56 consists of four Antenna Coupler CU-1772/SRA-56 (2 to 6 mc) drawer assemblies and one Power Supply PP-4993/SRA panel assembly mounted in Electrical Equipment Cabinet CY-6422/SRA-56. The associated impedance matching network to combine two of these coupler groups into an eight-channel configuration is Impedance Matching Network CU-1773/SRA-56.

Antenna Coupler Group AN/SRA-57 consists of four Antenna Coupler CU-1774/SRA-57 (4 to 12 mc) drawer assemblies and one Power Supply PP-4993/SRA panel assembly mounted in Electrical Equipment Cabinet CY-6423/SRA-57. The associated impedance matching network to combine two or more coupler groups into an eight-channel configuration is Impedance Matching Network CU-1775/SRA-57.

Antenna Coupler Group AN/SRA-58 consists of four Antenna Coupler CU-1776/SRA-58 (10 to 30 mc) drawer assemblies and one Power Supply PP-4993/SRA panel assembly mounted in Electrical Equipment Cabinet CY-6424/SRA-58.

1.4.1 Antenna Couplers CU-1772/SRA-56, CU-1774/SRA-57, and CU-1776/SRA-58

These three antenna couplers are physically and functionally identical, except for the differences in rf circuitry and components required to obtain the individual frequency ranges over which the antenna couplers operate.

Each antenna coupler is built as a slide-mounted drawer assembly for rapid access to subassemblies and components during maintenance. When required, the drawer assembly can be removed completely from the equipment cabinet while other channels in the coupler group are operating. The drawer assembly contains an electronic Q control assembly; a two-resonator bandpass filter; monitoring, control, and protective devices; and a front panel assembly.

The electronic Q control assembly, mounted on the surface of the bandpass filter box, permits the first resonator to operate at a relatively constant Q over the operating frequency range of the antenna coupler without physically adjusting the coupling between the rf input link and the input resonator of the bandpass filter. The bandpass filter consists of an input resonator assembly and output resonator assembly mounted in the filter box. Both resonator assemblies contain copper-coil inductors and tunable vacuum capacitors; the resonators are inductively coupled.

The monitoring, control and protective devices consist of front panel meters and indicators, voltage sensors, an air flow sensor, and an output resonator decoupling switch, with associated circuitry and transmitter interlock, mounted on a circuit control board. The monitoring and control circuits provide and enforce sequential tuning and shut down the transmitter if a malfunction or maladjustment of the antenna or antenna coupler occurs. The front panel assembly contains all operational controls and indicators required for tuning and operating the antenna coupler, an air intake fan that provides cooling air to the drawer assembly, and an air filter/grill assembly.

The drawer assembly is fabricated from bent, riveted, and welded aluminum sheets. Structural shapes are reinforced at the corners to obtain the strength, rigidity, and alignment required in the shipboard environment. The section of the filter box containing the resonator inductors is copper-clad aluminum to minimize losses and raise the Q of the resonators. The front panel of the drawer assembly is constructed of aluminum plate and is secured to the drawer frame with screws.

The overall sequence of tuning and the switching of associated interlock and protective circuits is controlled by a rotary switch mounted on the front panel. This switch also contains a keyline device for protection of the coupler and transmitter when switching from the tune to the operate mode. The tuning capacitors in the input and output resonators are each adjusted by means of front panel control knobs. Approximately 60 turns of either control are required to cover the frequency range of Antenna Couplers CU-1772/SRA-56 or CU-1774/SRA-57; 40 turns are required for Antenna Coupler CU-1776/SRA-58. To ensure smooth operation, a precision drive assembly is used, and positive stops are provided to prevent overdriving of the capacitors in either direction. Calibrated tape dials geared to the controls display resonator frequency within 2 percent.

Output coupling of the output resonator to the four-channel combiner mounted on the equipment cabinet is adjusted by a third control knob on the front panel; approximately 20 turns of the control are required to cover the adjustment range of the output coupling. The control knob drives a bearing block assembly through gearing and roller chain. The bearing block mates to the link drive assembly (located in the equipment cabinet) which physically moves the output link of the combiner with respect to the output resonator inductor to control the inductive coupling between them. A three-digit counter on the front panel is geared to the control drive assembly so that approximately 50 units corresponds to one revolution of the control knob to provide a relative indication of the output link position.

Two microammeters on the front panel display the forward and reflected rf power, and the sampled resonator voltages for tuning and operating the antenna coupler. Indicator lamps are provided to display the status of the antenna coupler during tuning and operation, and to warn the operator of a malfunction or maladjustment of the equipment. A guarded emergency switch is incorporated to disable the loss-of-air flow, overvoltage, and excessive vswr protection circuits for emergency operation.

1.4.2 Power Supply (Panel) PP-4993/SRA

The power supply panel is identical for all three antenna coupler groups. This unit consists of a power supply and an audible alarm unit mounted on a panel at the bottom of the equipment cabinet. The power supply consists of a full-wave rectifier and filter assembly that converts a filtered 115-volt ac input to a filtered, unregulated +35 volt dc (loaded) output. This dc voltage is required by the control and protective circuits of the coupler group. The alarm unit provides an audible alarm signal to indicate that the air flow is insufficient within one or more of the antenna coupler drawer assemblies in the equipment cabinet.

The power supply panel is fabricated from 3/16-inch aluminum stock and fastened to the equipment cabinet by captive screws. The transformer, rectifier diodes, filter capacitor, bleeder resistor, and alarm relay circuits are mounted on the back of the panel. The front of the panel contains the power on-off switch and indicator, protective fuses for the 115-volt ac and 35-volt dc circuits, and a silencer switch to shut off the audible alarm. All fuses have indicators that light to indicate a blown fuse. The audible alarm unit projects through the panel and, when activated, produces a 2800-cps tone to indicate a failure in the air flow system.

1.4.3 Electrical Equipment Cabinet CY-6422/SRA-56, CY-6423/SRA-57, and CY-6424/SRA-58

The equipment cabinet is a vertical rack that contains all the assemblies, subassemblies, components, and parts necessary for the operation of the antenna coupler group. Housed within the cabinet are the four antenna couplers and the power supply panel, four operate reflectometers, an rf relay assembly, a tune reflectometer, a four-channel combiner and all power and signal wiring required for the operation of the complete unit.

The cabinet is a single-bay rack fabricated of welded aluminum. The heavy duty roller-type slides for the antenna coupler drawer assemblies are equipped with a locking device to secure the assemblies when the drawers are fully extended, and the drawers are completely removable from the slides for ease of maintenance. Access to components mounted in the base of the cabinet for maintenance is obtained from either the front or rear of the enclosure. The back of the enclosure is fabricated in sections to provide access to the interconnecting cabling, power attenuator, and combiner assembly without removing the rf input or output connections.

1.4.4 Impedance Matching Network CU-1773/SRA-56 and CU-1775/SRA-58

The impedance matching network is used to couple two coupler groups (AN/SRA-56 or AN/SRA-57) to a single antenna for eight-channel operation. It is housed in a metal box with three rf connectors on the outside of the box; two connectors are used for input signals from the two adjacent cabinets of the antenna coupler group, and the third connector is used for the output signal to the common antenna. The impedance matching network, attached to the rear of both cabinets of the two antenna coupler groups, is a passive circuit that enables each channel to be coupled to any broadband antenna that exhibits a 3-to-1 vswr characteristic over the tuning range of the antenna coupler group.

1.5 REFERENCE DATA

Table 1-2 lists as reference data the basic characteristics of Antenna Coupler Groups AN/SRA-56, AN/SRA-57, and AN/SRA-58.

TABLE 1-2. REFERENCE DATA

ITEM	APPLICATION	CHARACTERISTIC
ANTENNA COUPLER GROUPS		
Frequency Range	Antenna Coupler Group AN/SRA-56	1.95 to 6.15 mc
	Antenna Coupler Group AN/SRA-57	3.90 to 12.30 mc
	Antenna Coupler Group AN/SRA-58	9.75 to 30.75 mc
Tuning Band	All antenna couplers in all coupler groups	One band, continuously variable across the frequency range of each coupler group
Frequency Control	All antenna couplers	Manual
RF Power Rating (maximum)	Each antenna coupler (channel)	1 kw average, 2 kw p-e-p
	Each coupler group	4 kw average, 8 kw p-e-p
Input VSWR	Each channel	Less than 1.05 to 1 for a 3 to 1 vswr load
Input Impedance	Each channel	50 ohms, nominal
Output Impedance	Each coupler group	50 ohms, nominal
Insertion Loss	Any channel	Less than 1.8 db
	Coupler group	Less than 2.0 db
Isolation	All coupler groups	Greater than 35 db between channels separated 5 percent in frequency
Bandwidth (3 db)	All antenna couplers	Greater than 12 kc
Stopband Attenuation		Greater than 60 db outside of tuning range
Tuning Dial Accuracy	All antenna couplers	±2 percent of tuned frequency
Meter Accuracy	All antenna couplers	±5 percent of full scale indication

TABLE 1-2. REFERENCE DATA (Continued)

ITEM	APPLICATION	CHARACTERISTIC
ANTENNA COUPLER GROUPS (Continued)		
Temperature Operating Range	All coupler groups	0° C (32° F) to 50° C (122° F)
Heat Dissipation (maximum)	Each antenna coupler Each coupler group	340 watts 1400 watts
Primary Power Required	Each coupler group	115 vac, single phase, 200 watts
REQUIRED ELECTRICAL CHARACTERISTICS OF ASSOCIATED ANTENNAS (GFM)		
VSWR	All coupler groups	Not greater than 3 to 1
RF Power-Handling Capability	Antenna Coupler Group AN/SRA-56	4 kw average, 8 kw p-e-p
	Eight-channel configuration	8 kw average, 16 kw p-e-p
	Antenna Coupler Group AN/SRA-57	4 kw average, 8 kw p-e-p
	Eight-channel configuration	8 kw average, 16 kw p-e-p
	Antenna Coupler Group AN/SRA-58	4 kw average, 8 kw p-e-p
REQUIRED ELECTRICAL CHARACTERISTICS OF ASSOCIATED TRANSMITTERS (GFM)		
Operating Frequency	Antenna Coupler Group AN/SRA-56	Any frequency between 2 and 6 mc
	Antenna Coupler Group AN/SRA-57	Any frequency between 4 and 12 mc
	Antenna Coupler Group AN/SRA-58	Any frequency between 10 and 30 mc
RF Power Output (minimum)	Any coupler group	500 watts average (less than 500 watts without transmitter protection or specified input vswr)
RF Power Output (maximum)	Any coupler group	1 kw average, 2 kw peak

1.6 EQUIPMENT SUPPLIED

Table 1-3 lists the equipment supplied with one antenna coupler group of each frequency range. The impedance matching network for Antenna Coupler Groups AN/SRA-56 or AN/SRA-57 is supplied only for an eight-channel configuration made from two complete coupler groups.

1.7 EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

Table 1-4 lists equipment and publications required but not supplied for one coupler group of each frequency range.

TABLE 1-3. EQUIPMENT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		OVERALL DIMENSIONS (IN.)			VOLUME (CU. FT.)	WEIGHT (LB.)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
WITH ANTENNA COUPLER GROUP AN/SRA-56							
1	Electrical Equipment Cabinet	CY-6422/ SRA-56	77.00	22.88	38.50	39.24	735*
4	Antenna Coupler	CU-1772/ SRA-56	14.00	19.00	29.00	4.46	87
1	Power Supply	PP-4993/ SRA	9.75	19.00	7.00	0.75	22
**	Impedance Matching Network	CU-1773/ SRA-56	13.12	32.00	8.09	1.97	29
	Technical Manuals	NAVSHIPS 0967-284-6010					
	Operator's Handbook	NAVSHIPS 0967-284-6020					

* Weight of equipment cabinet includes antenna couplers and power supply installed. Weight of cabinet without these units is 365 pounds.

** Impedance Matching Network CU-1773/SRA-56 supplied only with 8-channel configurations (two coupler groups).

WITH ANTENNA COUPLER GROUP AN/SRA-57

1	Electrical Equipment Cabinet	CY-6423/ SRA-57	77.00	22.88	38.50	39.24	703*
4	Antenna Coupler	CU-1774/ SRA-57	14.00	19.00	29.00	4.46	79
1	Power Supply	PP-4993/ SRA	9.75	19.00	7.00	0.75	22
**	Impedance Matching Network	CU-1775/ SRA-57	13.12	38.00	8.09	1.97	29

* Weight of equipment cabinet includes antenna couplers and power supply installed. Weight of cabinet without these units is 365 pounds.

** Impedance Matching Network CU-1775/SRA-57 supplied only with 8-channel configurations (two coupler groups).

TABLE 1-3. EQUIPMENT SUPPLIED (Continued)

QTY PER EQUIP	NOMENCLATURE		OVERALL DIMENSIONS (IN.)			VOLUME (CU. FT.)	WEIGHT (LB.)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
WITH ANTENNA COUPLER GROUP AN/SRA-57 (Continued)							
	Technical Manuals	NAVSHIPS 0967-284-6010					
	Operator's Handbook	NAVSHIPS 0967-284-6020					
WITH ANTENNA COUPLER GROUP AN/SRA-58							
1	Electrical Equipment Cabinet	CY-6424/ SRA-58	77.00	22.88	38.50	39.24	699*
4	Antenna Coupler	CU-1776/ SRA-58	14.00	19.00	29.00	4.46	78
1	Power Supply	PP-4993/ SRA	9.75	19.00	7.00	0.75	22
	Technical Manuals	NAVSHIPS 0967-284-6010					
	Operator's Handbook	NAVSHIPS 0967-284-6020					
* Weight of equipment cabinet includes couplers and power supply installed. Weight of cabinet without these units is 365 pounds.							

TABLE 1-4. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
EQUIPMENT REQUIRED				
As Req'	Transmitter	On Board	Operation, troubleshooting, and maintenance	1 kw average power; 2 to 30 mc
1	Receiver	On Board	Precision dummy load calibration	2 to 30 mc
1	Multimeter	AN/PSM-4D	Troubleshooting and maintenance	20 k ohms per volt dc; 5 k ohms per volt ac; 0 to 100 k ohms resistance

TABLE 1-4. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Continued)

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
EQUIPMENT REQUIRED (Continued)				
1	Impedance Bridge	AN/URM-39	Precision dummy load calibration	
2	Electronic Voltmeter	AN/URM-155	Maintenance	RF probe, ±1 db; 500 kc to 500 mc; 80 k ohms at 10 mc less than 5 pf input
2	Variable Voltmeter	CN-796/U	Maintenance	0 to 101 db
1	Digital Electronic Counter	CP-772/U	Maintenance	0 to 50 mc
1	Electrical Dummy Load	DA-233/U	Precision dummy load calibration	50 ohms, precision
3	Electrical Dummy Load	DA-242/U	Maintenance	50 ohms, 2.5 kw
1	Multimeter	ME-303/U	Maintenance	0.5 to 300 volts ac 0.015 to 1500 volts dc
1	RF Cable	RG-18A/U	Antenna lead	Single antenna coupler group
4	RF Cable	RG-215/U	RF input to antenna coupler group	
*	RF Cable	RG-319A/U	Antenna lead	8-channel configuration only
1	Signal Generator	SG-582/U	Maintenance	50 kc to 65 mc
1	Electrical Cable	DSGA-2	AC power cable	2 active conductors
1	Electrical Cable	MSCA-24	Transmitter interlock and keyline	24 conductor cable, 18 active, 6 spare
2	Coaxial Switch	Bird 72A	Maintenance	

* RF Cable RG-319A/U required only for 8-channel configuration of Antenna Coupler Groups AN/SRA-56 or AN/SRA-57

TABLE 1-4. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Continued)

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
EQUIPMENT REQUIRED (Continued)				
2	Digital Voltmeter	Digitec 201	Maintenance	1 millivolt to 100 volts dc
2	Probe Coaxial Tee Adaptor	Hewlett Packard HP-11042A	Maintenance	
1	Termination	Microlab/FRX TA-5MN	Maintenance	50 ohms
1	RF Wattmeter	Sierra 164B-FNM	Maintenance	
1	Plug-in element for RF Wattmeter	Sierra 270A-30	Maintenance	
1	Variable Attenuator	Telonic TCB-50A	Maintenance	0 to 10.9 db in 0.1 db steps
1	Resistor		Maintenance	1 k, fixed, shielded
1	AC Voltage Source		Troubleshooting and maintenance	115 volts ac, single phase, 200 watts
1	Power Supply		Troubleshooting and maintenance	35 volts dc, 0.4 amperes
1	Control System Cable & Test Set	Special	Maintenance	See paragraph 5.2.1.2.1
2	RF Test Cable	Special	Maintenance	See paragraph 5.2.1.2.2
1	Test Cover	Special	Maintenance	See paragraph 5.2.2.2.1
1	Reflectometer Test Set	Special	Maintenance	See paragraph 5.2.2.2.2
1	Precision Dummy Load	Special	Maintenance	See paragraph 5.2.2.2.3
As Req'd	RF Cables, Connectors, & Adaptors		Installation, troubleshooting, and maintenance	

TABLE 1-4. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Continued)

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
PUBLICATIONS REQUIRED				
1	Handbook of Test Methods & Practices	NAVSHIPS 0967-000-0103	Troubleshooting, and maintenance	
1	Electronics Installation & Maintenance	NAVSHIPS 0967-000-0120	Installation, troubleshooting, & maintenance	

1.8 EQUIPMENT SIMILARITIES

Table 1-5 lists the similarities and differences that exist between the three Antenna Coupler Groups, AN/SRA-56, AN/SRA-57, and AN/SRA-58.

TABLE 1-5. BASIC SIMILARITIES IN ANTENNA COUPLER GROUPS

ITEM	ANTENNA COUPLER GROUP		
	AN/SRA-56	AN/SRA-57	AN/SRA-58
Antenna Coupler	CU-1772/SRA-56	CU-1774/SRA-57	CU-1776/SRA-58
Power Supply	PP-4993/SRA	PP-4993/SRA	PP-4993/SRA
Equipment Cabinet	CY-6422/SRA-56	CY-6423/SRA-57	CY-6424/SRA-58
Impedance Matching Network	CU-1773/SRA-56	CU-1775/SRA-57	None
Frequency Range (mc)	2 to 6	4 to 12	10 to 30
Channels per Group	4	4	4
Maximum Configuration	8	8	4
Maximum RF Power Per Channel	1 kw average 2 kw peak	1 kw average 2 kw peak	1 kw average 2 kw peak
Primary Power	115 volts ac	115 volts ac	115 volts ac
Instruction Manuals (NAVSHIPS)	0967-284-6010	0967-284-6010	0967-284-6010
Operator's Handbook (NAVSHIPS)	0967-284-6020	0967-284-6020	0967-284-6020

1.9 PREPARATION FOR RESHIPMENT

To prepare a coupler group for reshipment, perform the procedures given in the following paragraphs.

1.9.1 Disassembly

For two equipment cabinets combined to form an eight-channel coupler group, follow all steps given below; for a single equipment cabinet, follow steps 5 through 9 only.

Step 1. Refer to paragraph 5.3.1.16, and remove the impedance matching network. Replace the impedance matching network cover removed in the procedures.

Step 2. Remove rear joining strips between the cabinets and replace two lower screws in receptacle 1A6J1 of each cabinet.

Step 3. For Antenna Coupler Groups AN/SRA-57 only, perform the following steps:

a. Remove rear cover from both cabinets.

b. Remove straps from receptacle 1A6J1 to the top of the output link assembly of the combiner on both cabinets.

c. Remove straps from stowage position on the combiner chassis; on both cabinets, connect one strap between receptacle 1A6J1 and inductor 1A6L1 and the other between capacitor 1A6C5 and the top of the output link assembly. Place straps removed in step b in the stowage positions on the combiners.

d. Replace rear cover on both cabinets.

Step 4. Remove joining strips from the front and top of the cabinets.

Step 5. Remove all rf input cables from each cabinet.

Step 6. Rotate OUTPUT COUPLING control on all antenna couplers in the DECREASE direction to the stops. Lock the controls.

Step 7. Rotate FREQ ADJUST OUTPUT and FREQ ADJUST INPUT controls on all antenna couplers in the INCREASE direction to the stops. Lock the controls.

Step 8. Refer to paragraphs 5.3.1.2, and remove power supply panel from cabinet. Disconnect primary power, transmitter interlock, and transmitter keyline cables from terminal boards, and remove cables through rear of cabinet.

Step 9. Remove 12 bolts from base of cabinet that attach the equipment cabinet to the foundation. Retain the bolts.

1.9.2 Packing

Follow the procedures given below to pack the equipment for shipment.

Step 1. Remove cabinet from its foundation and place on shipping pallet.

Step 2. Bolt the base of the cabinet to the pallet using the bolts removed in step 9 of paragraph 1.9.1. Replace power supply panel in accordance with paragraph 5.3.1.2.

Step 3. Strap the equipment to the pallet and cover with a waterproof cover.

Step 4. Crate the equipment and mark the crate in accordance with applicable specifications.

Step 5. Pack all technical manuals in a suitable waterproof container marked "TECHNICAL MANUALS FOR AN/SRA-56, -57, AND -58."

SECTION 2

INSTALLATION

2.1 SCOPE

This section contains general installation data intended only to complement, not to take precedence over, the specific installation data generated by the Installing Activity.

2.2 POWER REQUIREMENTS

Antenna Coupler Groups AN/SRA-56, -57, and -58 each require 115-vac, 60-cps, single-phase primary power to operate the cooling fans in each antenna coupler drawer and the +35 volt power supply in the equipment cabinet. Each antenna coupler group requires 200 watts of primary power. Refer to figure 5-49 for the primary and dc power distribution diagram.

2.3 INSTALLATION REQUIREMENTS

2.3.1 Preferred Location

Locate the antenna coupler groups as close as possible to the associated transmitters, rf and control patching facilities, and antenna feeds. Provide adequate working clearances at both the front and rear of the coupler group for repair and maintenance requirements and for ventilation. Provide at least 6 feet of clearance measured from the front of the cabinet and at least 2 feet of clearance measured from the rear of the combiner for four-channel configurations or from the rear of the impedance matching network for eight-channel configurations.

2.3.2 Outline Drawing and Interconnection Diagrams

The overall dimensions and minimum clearance requirements for a typical antenna coupler group are shown in figures 2-1 and 2-2. An interconnection diagram is presented in figure 5-48 for typical installations of the coupler groups. Connection to associated transmitters may be either through a patch board or direct, but the Installing Activity must determine the final installation and interconnecting plans of a particular installation. Interconnecting cables are not supplied with this equipment.

2.3.3 Single Antenna Coupler Group Installation

The following are suggested procedures for installing a single equipment cabinet to form a four-channel coupler group. Where a conflict arises between these suggested procedures and those issued by the Installing Activity, follow Installing Activity procedures.

Step 1. Uncrate the equipment and remove straps that secure the cabinet to the shipping pallet.

Step 2. Refer to paragraph 5.3.1.2, and remove power supply panel.

Step 3. From the base of the cabinet, remove the bolts that hold the cabinet to the shipping pallet.

Step 4. Lift the equipment cabinet from the pallet and place on prepared foundation.

Step 5. Bolt the cabinet to the foundation using the bolts removed in step 2.

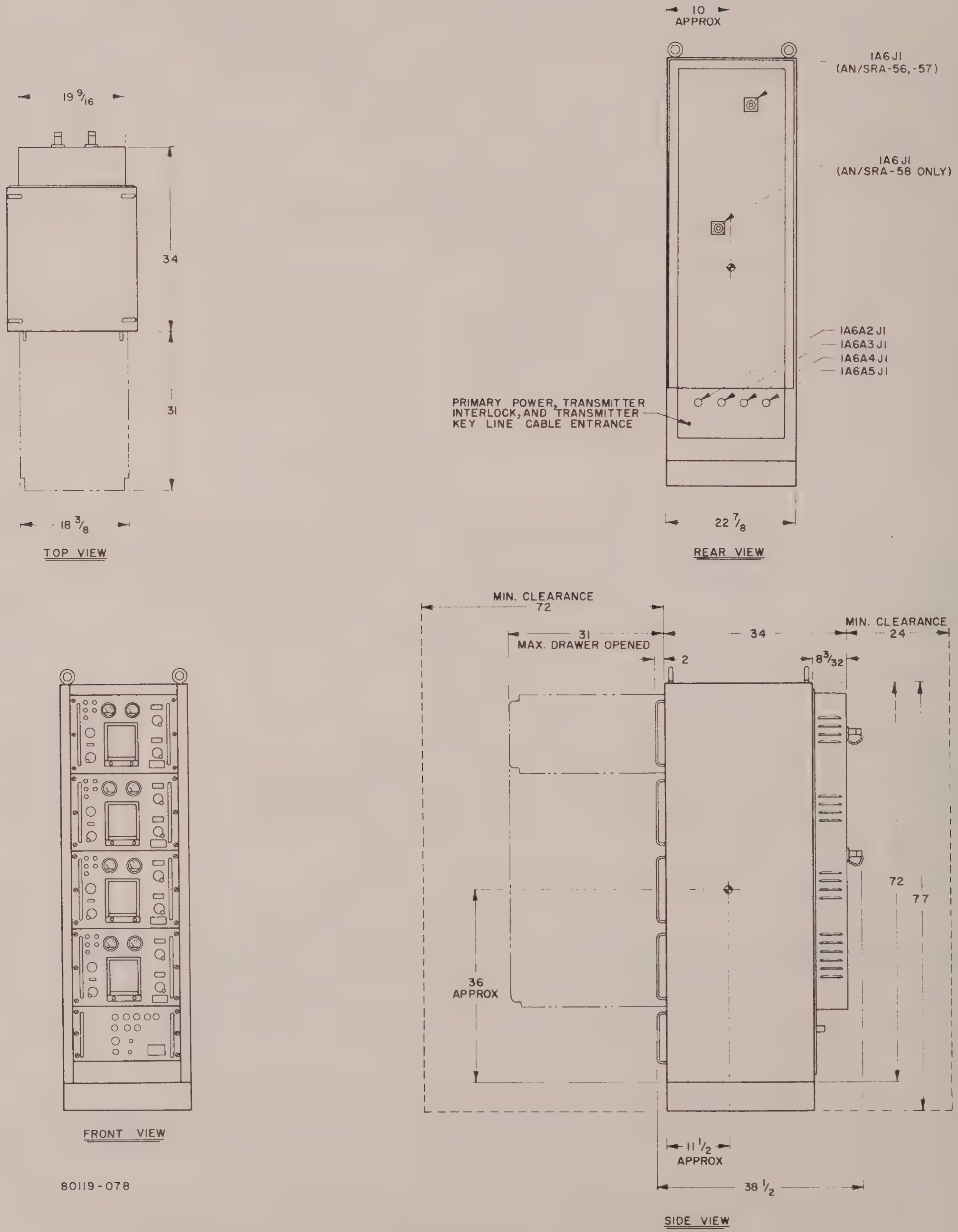
10
APPROX
1A6J1
(AN/SRA-56,-57)
1A6J1
(AN/SRA-58 ONLY)
1A6A2J1
1A6A3J1
1A6A4J1
1A6A5J1
PRIMARY POWER, TRANSMITTER INTERLOCK, AND TRANSMITTER KEY LINE CABLE ENTRANCE
22 7/8
REAR VIEW
19 9/16
34
31
18 3/8
TOP VIEW
FRONT VIEW
80119-078
MIN. CLEARANCE
72
31
MAX. DRAWER OPENED
2
34
MIN. CLEARANCE
24
8 3/32
72
77
36
APPROX
11 1/2
APPROX
38 1/2
SIDE VIEW

Figure 2-1 Outline Drawing and Minimum Clearance Dimensions for Antenna Coupler Groups AN/SRA-56, -57, or -58

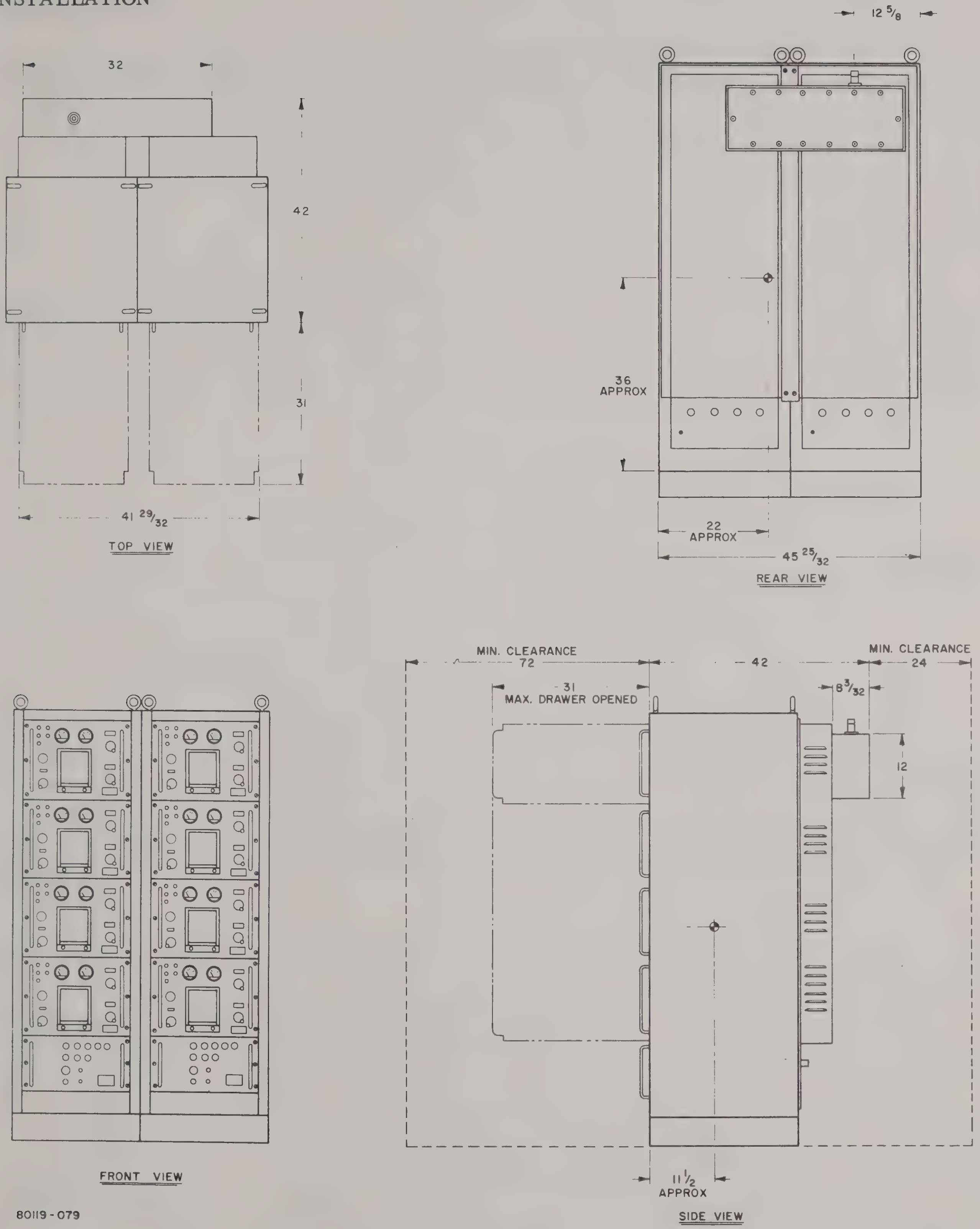
32
42
31
41 29/32
TOP VIEW
12 5/8
36
APPROX
22
APPROX
45 25/32
REAR VIEW
FRONT VIEW
MIN. CLEARANCE
72
42
MIN. CLEARANCE
24
31
MAX. DRAWER OPENED
8 3/32
12
11 1/2
APPROX
SIDE VIEW
80119-079

Figure 2-2 Outline Drawing and Minimum Clearance Dimensions for Eight-Channel Configurations for Antenna Coupler Group AN/SRA-56 or -57

Step 6. Insert primary power, transmitter interlock, and transmitter keyline cables through rear of cabinet (refer to paragraph 2.3.5 for cable information), and make connections at the terminal boards in accordance with figure 5-48.

Step 7. Replace power supply panel in accordance with paragraph 5.3.1.2.

Step 8. Connect all input and output rf cables.

2.3.4 Eight-Channel Configuration Installation

When two coupler groups are combined to form an eight-channel configuration, the equipment cabinets must be joined together by special joining strips and the impedance matching network must be installed. The following are suggested procedures for installing two equipment cabinets to form an eight-channel configuration. When a conflict arises between these suggested procedures and those issued by the Installing Activity, follow the Installing Activity procedures.

Note

Perform inspections and checks in paragraph 2.4.1 before installing impedance matching network.

Step 1. Install the individual coupler group cabinets by following steps 1 through 7 in paragraph 2.3.3.

Step 2. Join the two cabinets at the top and front.

Step 3. For Antenna Coupler Group AN/SRA-57 only, perform the following steps:

a. Remove rear cover from both coupler group cabinets.

b. Remove shorting straps from between receptacle 1A6J1 and inductor 1A6L1, and between capacitor 1A6C1 and top of the output link assembly of both cabinets.

c. Remove the shorting strap from the stowage position on the side of the combiners, and connect the strap from receptacle 1A6J1 to the top of the output link assembly of both cabinets. Place the straps removed in step b in the stowage position.

d. Replace the rear cover of both cabinets.

Step 4. Remove the two lower screws from receptacle 1A6J1 of both cabinets, and join the cabinets at the rear with joining strips.

Step 5. Remove the cover from the impedance matching network, and lift the impedance matching network into place so that plugs 1P1 and 1P2 of the impedance matching network line up with receptacles 1A6J1 of both cabinets. Ensure that the six mounting holes of the impedance matching network also line up with the captive nut holes in the rear cover.

Step 6. With two men holding the network in place, connect plugs 1P1 and 1P2 of the impedance matching network to receptacles 1A6J1 of each cabinet.

Step 7. Install the two mounting screws in the center of the impedance matching network, and then the remaining six screws.

Step 8. On both cabinets, attach one end of the shorting strap to the end of receptacle 1A6J1 with the screws removed in step 4. Attach the other end of the strap to the chassis of the impedance matching network with mounting hardware.

Step 9. Replace the cover on the impedance matching network.

Step 10. Connect all input and output rf cables.

2.3.5 Cable Assemblies

All external cabling is to be run by installation personnel from plans furnished by the Installing Activity. However, the following guidelines should be observed when making cable runs:

a. Although there are no critical lengths applicable to any of the required cabling between transmitters and patch boards, or between patch boards and coupler groups, keep cables as short as is consistent with good installation practice.

b. Support all cables at frequent intervals along the cable run.

c. Observe standard precautions, such as minimum bend-radius, prevention of chaffing, etc., for each individual cable.

Table 2-1 is a list of the cables required for installation of the antenna coupler groups. Note that the length of the cable and the connector at the other end of the cable are as required by the particular installation specified by the Installing Activity.

2.3.6 Interconnections and Modifications to Transmitters

The coupler groups require interconnection between the keyline and interlock circuits of each transmitter and the associated channel of the coupler group. When these interconnections are made, the transmitters are protected from damage by improper operation of the coupler group, and the coupler group is protected during tuning and operation by removing the rf power to the individual antenna couplers when required. Any modifications to the transmitter interlock and keyline system must be made by installation personnel in accordance with instructions furnished by the Installing Activity. Because interconnections and modifications differ for the various transmitters that can be used with the coupler groups, they are not specified by this technical manual.

2.4 PREOPERATIONAL CHECKOUT

Perform the following procedures before releasing the equipment to operating personnel. Observe all cautions and warnings to prevent damage to the equipment or injury to installation personnel.

2.4.1 Inspections and Checks

Make the following inspections, checks, and adjustments before energizing the equipment for the first time. If the equipment fails to pass any inspection or check, or cannot be adjusted properly, refer to the maintenance procedures in Section 5 and correct the trouble before continuing.

Step 1. Ensure that all transmitters associated with the coupler groups are OFF, and that primary power (115 vac) to the coupler group is disconnected at the source.

TABLE 2-1. CABLE ASSEMBLIES REQUIRED FOR EQUIPMENT INSTALLATION

TYPE OF CABLE*					
NAME	DESIGNATION	CONNECTOR**	ACTIVE CONDUCTORS	SPARE CONDUCTORS	CABLES REQUIRED
FOUR-CHANNEL OPERATION (ALL GROUPS)					
AC Power Cable	DSGA-2	Ring Terminal	2	0	1
Transmitter Interlock and Keyline	MSCA-24	Ring Terminal	18	6	1
Transmitter RF Input	RG-215/U	UG-943A/U	1	0	4
Coupler Group RF Output	RG-18A/U	UG-154/U	1	0	1
Grounding Strap			1	0	1
EIGHT-CHANNEL OPERATION (AN/SRA-56 AND AN/SRA-57 ONLY)					
AC Power Cable	DSGA-2	Ring Terminal	2	0	2
Transmitter Interlock and Keyline	MSCA-24	Ring Terminal	18	6	2
Transmitter RF Input	RG-215/U	UG-943A/U	1	0	8
Coupler Group RF Output	RG-319 A/U	Andrew No. 87R	1	0	1
Grounding Strap			1	0	2

* Cables are GFM. Length of individual cables are as required by the particular installation.

** Connectors listed are at equipment end. Connectors at other end are GFM and as required by the particular installation.

Step 2. Visually inspect the exterior of the equipment cabinets for damage.

Step 3. Refer to paragraph 5.3.1.2, and remove power supply panel from each cabinet. Check to ensure that ac power and interlock and keyline cables are properly connected at the terminal boards in accordance with the interconnection diagram in figure 5-48.

Step 4. Visually and manually inspect all receptacles, plugs, and cables in the base of the cabinet for looseness or damage. Replace the power supply panels.

Step 5. Remove rear cover from each equipment cabinet, and visually and manually inspect all receptacles, plugs and cables to the power attenuator and the individual antenna coupler, all components in the power attenuator, and all combiner components for looseness and damage. Replace rear covers.

Step 6. One by one, open each antenna coupler drawer assembly, and remove top and bottom covers.

Step 7. Visually and manually inspect all components and parts within each drawer for looseness or damage, and for accumulation of dust, dirt, or corrosion.

Step 8. Visually and manually inspect all receptacles, plugs, and cables within each drawer for looseness or damage.

Step 9. Replace top and bottom covers, and secure antenna coupler drawer assembly.

Step 10. Visually inspect all air filters to ensure that they are free from dust and dirt.

Step 11. Unlock and rotate OUTPUT COUPLING, FREQ ADJUST INPUT, and FREQ ADJUST OUTPUT controls to check for binding, looseness, or other abnormal conditions.

Note

> OUTPUT COUPLING control does not move as freely as the other controls.

Step 12. Mechanically zero all RF POWER FORWARD and RF POWER REFLECTED meters with screwdriver adjustment below each meter.

Step 13. Ensure that transmitter interlock and keyline cables from the antenna couplers are patched or connected to the associated transmitters.

Step 14. Ensure that the rf outputs from the coupler groups are patched or connected to their associated antenna (or ship dummy load).

2.4.2 Preliminary Settings

Verify or establish the following preliminary settings before proceeding with the checkout of the antenna coupler groups.

Step 1. Operate POWER ON/OFF switch on the power supply panel of coupler groups to OFF.

Step 2. Rotate TUNE/OPERATE switch on all antenna couplers to OFF.

Step 3. Rotate OUTPUT COUPLING control on all antenna couplers in the maximum DECREASE direction to the stop.

Step 4. Operate EMERGENCY ON/OFF switch on all antenna couplers to OFF.

2.4.3 Energizing the Equipment for the First Time

The procedures given below will establish the operational readiness of the antenna coupler groups. Follow these procedures in the exact order given for all antenna couplers in each coupler group. Do not release the equipment to operating personnel until all procedures have been completed.

2.4.3.1 Control System Checkout

Before applying rf power to the equipment, completely check out the control system in accordance with the following procedures. These procedures ensure that all monitoring, control, and protective devices are functioning properly. Perform the procedures in the exact order given.

Step 1. Refer to paragraph 5.2.1.5.1 and perform all control system checks contained in paragraphs 5.2.1.5.1.1 through 5.2.1.5.1.3.

CAUTION

Do not perform procedures in paragraph 5.2.1.5.1.4 until after calibration procedures in step 2 have been completed.

Step 2. Refer to paragraph 5.2.1.5.4 and perform all control system calibration procedures under that paragraph.

Step 3. Refer to paragraph 5.2.1.5.1.4 and complete the control system check.

2.4.3.2 Operational Checkout

After the control circuits have been checked, calibrated, and found to be acceptable, tune and operate each coupler group in the normal manner to verify that the equipment is operational. Check each antenna coupler at the low, middle and high frequencies of the band over which it operates. For convenience, start the check with antenna coupler (channel) 1A1 and proceed in order through the remaining channels of the coupler group. Perform this check for each antenna coupler in the following manner:

Step 1. In accordance with the applicable technical manual, set each associated transmitter to the lower test frequency given in table 2-2.

TABLE 2-2 TEST FREQUENCIES FOR CHECKOUT OF ANTENNA COUPLER PERFORMANCE

ANTENNA COUPLER	TEST FREQUENCIES		
	LOWER	MIDDLE	UPPER
CU-1772/SRA-56	2.0 mc	4.0 mc	6.0 mc
CU-1774/SRA-57	4.0 mc	8.0 mc	12.0 mc
CU-1776/SRA-58	10.0 mc	20.0 mc	30.0 mc

Step 2. Refer to Section 3 (Operator's Handbook) and tune the antenna coupler in the normal manner. Observe all warnings and cautions.

Step 3. Allow the antenna coupler to operate for 30 minutes.

Step 4. Secure the antenna coupler in accordance with the procedures given in Section 3. (Operator's Handbook)

Step 5. Repeat steps 1 through 4 for all other antenna couplers in the group.

Step 6. Set each associated transmitter to the middle test frequency given in table 2-2, and repeat steps 2 through 5.

Step 7. Set each associated transmitter to the upper test frequency given in table 2-2, and repeat steps 2 through 5.

Step 8. Set associated transmitter to the frequencies specified in table 2-3 and repeat step 2 to bring each antenna coupler up to the operate condition.

TABLE 2-3 TEST FREQUENCIES FOR CHECKOUT OF OVERALL COUPLER GROUP PERFORMANCE

ANTENNA COUPLER	ANTENNA COUPLER GROUP		
	AN/SRA-56	AN/SRA-57	AN/SRA-58
COUPLER GROUP NO. 1			
1A1	2.0	4.0	10.0
1A2	3.0	6.0	17.0
1A3	5.0	10.0	25.0
1A4	6.0	12.0	30.0
COUPLER GROUP NO. 2			
1A1	2.5	5.0	-
1A2	3.5	7.0	-
1A3	4.5	9.0	-
1A4	5.5	11.0	-

Note

For single Antenna Coupler Groups AN/SRA-56 or AN/SRA-57 operating in a four-channel configuration, use only the frequencies for Coupler Group No. 1.

Step 9. Allow the antenna coupler group to operate for 30 minutes.

Step 10. Deenergize each transmitter in accordance with the technical manual for the transmitter.

Step 11. Rotate TUNE/OPERATE control on all antenna couplers to OFF.

Step 12. Rotate OUTPUT COUPLING control on all antenna couplers in the maximum DECREASE direction to the stop.

Step 13. Operate POWER ON/OFF switch on all power supply panels to OFF.

2.4.3.3 Initial Reference Standards Measurements

At installation, it is necessary to measure and record certain characteristics (operational parameters) of the antenna couplers and coupler groups. This information is used as the intial reference standards against which shipboard maintenance personnel can compare the performance of the equipment. Perform the following procedures for each antenna coupler in the coupler group and record the applicable information in tables 2-4 through 2-6.

Step 1. Record the coupler group and serial number of the equipment cabinet in tables 2-4 through 2-6.

Step 2. Record the serial number of each antenna coupler in the coupler group and the position it occupies in the equipment cabinet. Do not change the positions of the antenna couplers during these procedures.

Step 3. Refer to paragraph 5.2.1.5.3 and perform all procedures in that paragraph for each antenna coupler in the coupler group. Record all information specified by these procedures under the Worst-Case 3 to 1 VSWR Load Characteristics in table 2-4.

Step 4. Refer to paragraph 5.2.1.5.5 and perform all procedures in that paragraph for each antenna coupler in the coupler group. Record all information specified by these procedures under the Insertion Loss Characteristics in table 2-5.

Step 5. Refer to paragraph 5.2.1.5.6 and perform all procedures in that paragraph for the coupler group. Record all information specified by these procedures under Isolation Characteristics in table 2-6.

Step 6. Mark this technical manual to ensure that the manual stays with the particular equipment for which the information recorded in tables 2-4 through 2-6 applies.

TABLE 2-4 INSTALLATION RECORD OF REFERENCE STANDARDS MEASUREMENTS OF WORST CASE 3-TO-1 VSWR LOAD

Antenna Coupler Group AN/SRA-____ Date ____________

Equipment Cabinet Serial Number ____________

Dummy Load Serial Numbers (a) ____________, (b) ____________, (c) ____________

ITEM	ANTENNA COUPLER			
	1A1	1A2	1A3	1A4
Serial Number				

MEASUREMENT WITH TEST CABLE A

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
Forward Power (measured)				
Reflected Power (measured)				
VSWR				

MEASUREMENT WITH TEST CABLE B

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
Forward Power (measured)				
Reflected Power (measured)				
VSWR				

Remarks ____

____

____

TABLE 2-5 INSTALLATION RECORD OF REFERENCE STANDARDS MEASUREMENT OF INSERTION LOSS

Antenna Coupler Group AN/SRA-____ Date ________________

Equipment Cabinet Serial Number ____________

Dummy Load Serial Number _____________

ITEM	ANTENNA COUPLER			
	1A1	1A2	1A3	1A4
Serial Number				

LOWER FREQUENCY LIMIT

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
RF Input Voltage				
RF Output Voltage				
Insertion Loss (Relative)				
Insertion Loss (Detailed)				

UPPER FREQUENCY LIMIT

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
RF Input Voltage				
RF Output Voltage				
Insertion Loss (Relative)				
Insertion Loss (Detailed)				

Remarks ____

TABLE 2-6 INSTALLATION RECORD OF REFERENCE STANDARDS FOR MEASUREMENT OF ISOLATION

Antenna Coupler Group AN/SRA-__________ Date ____________________

Equipment Cabinet Serial Number ________________

Dummy Load Serial Number ____________________

ITEM	TEST FREQUENCIES					
	LOWER		MIDDLE		UPPER	
	F_1	F_1±5%	F_2	F_2±5%	F_3	F_3±5%
ISOLATION BETWEEN ANTENNA COUPLERS 1A1 AND 1A2						
Channel Designation	A	B	A	B	A	B
Antenna Couplers	1A1	1A2	1A1	1A2	1A1	1A2
Serial Number						
Measurement Frequency (F, F+5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F+5%						
Attenuation at F+5% (interaction)						
Isolation						
Measurement Frequency (F, F-5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F-5%						
Attenuation at F-5% (interaction)						
Isolation						

Remarks ____

____

TABLE 2-6 INSTALLATION RECORD OF REFERENCE STANDARDS FOR MEASUREMENT OF ISOLATION (Continued)

Antenna Coupler Group AN/SRA-_________ Date _______________

Equipment Cabinet Serial Number_______________

Dummy Load Serial Number____________________

	TEST FREQUENCIES					
ITEM	LOWER		MIDDLE		UPPER	
	F_1	$F_1 \pm 5\%$	F_2	$F_2 \pm 5\%$	F_3	$F_3 \pm 5\%$
ISOLATION BETWEEN ANTENNA COUPLERS 1A2 AND 1A3						
Channel Designation	A	B	A	B	A	B
Antenna Couplers	1A2	1A3	1A2	1A3	1A2	1A3
Serial Number						
Measurement Frequency (F, F+5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F+5%						
Attenuation at F+5% (interaction)						
Isolation						
Measurement Frequency (F, F-5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F-5%						
Attenuation at F-5% (interaction)						
Isolation						

Remarks____

____

TABLE 2-6 INSTALLATION RECORD OF REFERENCE STANDARDS FOR MEASUREMENT OF ISOLATION (Continued)

Antenna Coupler Group AN/SRA-________ Date ________________

Equipment Cabinet Serial Number______________

Dummy Load Serial Number__________________

ITEM	TEST FREQUENCIES					
	LOWER		MIDDLE		UPPER	
	F_1	$F_1 \pm 5\%$	F_2	$F_2 \pm 5\%$	F_3	$F_3 \pm 5\%$
ISOLATION BETWEEN ANTENNA COUPLERS 1A3 AND 1A4						
Channel Designation	A	B	A	B	A	B
Antenna Couplers	1A3	1A4	1A3	1A4	1A3	1A4
Serial Number						
Measurement Frequency (F, F+5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F+5%						
Attenuation at F+5% (interaction)						
Isolation						
Measurement Frequency (F, F-5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F-5%						
Attenuation at F-5% (interaction)						
Isolation						

Remarks____

____

TABLE 2-6 INSTALLATION RECORD OF REFERENCE STANDARDS FOR MEASUREMENT OF ISOLATION (Continued)

Antenna Coupler Group AN/SRA-_________ Date __________________

Equipment Cabinet Serial Number________________

Dummy Load Serial Number_____________________

ITEM	TEST FREQUENCIES					
	LOWER		MIDDLE		UPPER	
	F_1	$F_1 \pm 5\%$	F_2	$F_2 \pm 5\%$	F_3	$F_3 \pm 5\%$
ISOLATION BETWEEN ANTENNA COUPLERS 1A4 AND 1A1						
Channel Designation	A	B	A	B	A	B
Antenna Couplers	1A4	1A1	1A4	1A1	1A4	1A1
Serial Number						
Measurement Frequency (F, F+5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F+5%						
Attenuation at F+5% (interaction)						
Isolation						
Measurement Frequency (F, F-5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F-5%						
Attenuation at F-5% (interaction)						
Isolation						

Remarks____

____

SECTION 3

OPERATION

3.1 SCOPE

Technical manual NAVSHIPS 0967-284-6020 covers the operation of Antenna Coupler Groups AN/SRA-56, AN/SRA-57, and AN/SRA-58. Description, installation, troubleshooting, maintenance, and parts list information for these equipments is bound separately as NAVASHIPS 0967-284-6010.

Technical manual NAVSHIPS 0967-284-6020 is in effect upon receipt and does not supersede any other manual. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

3.2 FUNCTIONAL OPERATION

Antenna Coupler Groups AN/SRA-56, -57 and -58 are identical in functional operation except for the frequency range over which each operates. Antenna Coupler Group AN/SRA-56 operates in the nominal frequency range from 2 to 6 mc; Antenna Coupler Group AN/SRA-57, in the frequency range from 4 to 12 mc; and Antenna Coupler Group AN/SRA-58, in the frequency range from 10 to 30 mc.

Each coupler group provides four separate channels to permit up to four transmitters to be connected simultaneously to an associated, common antenna. However, two Antenna Coupler Groups AN/SRA-56, or two Antenna Coupler Groups AN/SRA-57, can be combined to provide an eight-channel configuration, thus permitting up to eight transmitters to share the same antenna. Antenna Coupler Group AN/SRA-58 can be used only in a four-channel configuration.

Each antenna coupler group is physically self-contained in a separate electrical equipment cabinet containing four antenna coupler (channel) drawer assemblies and a common power supply panel.

To form an eight-channel configuration, two equipment cabinets (AN/SRA-56 or AN/SRA-57) are bolted together and the rf outputs are combined with an impedance matching network mounted on the rear of the cabinets.

Functionally, the antenna couplers within each antenna coupler group provide the means to couple the individual transmitters, each having power outputs as high as 1 kilowatt average or 2 kilowatts peak envelope power, to a single broadband antenna. Each antenna coupler permits the transfer, filtering, and matching of rf power from its associated transmitter to the antenna while preventing interference caused by the flow of significant rf power into that transmitter from other transmitters operating through the same coupler group.

Any antenna coupler may be operated at any frequency within the frequency range covered by the antenna coupler group, provided that the frequency is separated more than 5 percent from the operating frequency of any other antenna coupler within the same coupler group.

Each antenna coupler contains monitoring, control, and protective circuits that provide and enforce sequential tuning and operation. The power supply panel in each coupler group contains a fused circuit that provides ac to operate the cooling air fans in each antenna coupler to remove the heat generated during tuning and operation, a power supply that provides dc to operate the control and protective circuits, and a sonic generator that provides an audible alarm to warn the operator of a loss of air flow within an antenna coupler.

In operation, rf power from each transmitter is fed to the coupler group through individual 50-ohm coaxial transmission lines. The individual rf signals enter the coupler group through separate operate reflectometers (which continuously monitor the forward and reflected rf power components of the signal) and are delivered to the rf relay assembly. Depending upon the state of the rf relays in the rf relay assembly, each individual signal is fed directly to its associated antenna coupler (during operation) or to the power attenuator and tune reflectometer (during tuning). The power attenuator and tune reflectometer are shared by all four antenna couplers within the coupler group, and only one transmitter at a time is permitted access to these components. The power attenuator acts as a dummy load for the transmitter during tuning and reduces the power level so that only a small portion of the transmitter rf is applied to the antenna during the tuning procedures. The tune reflectometer is more sensitive than the operate reflectometer and is used to adjust the output coupling when loading the antenna coupler.

Each antenna coupler is interlocked with its associated transmitter to prevent the rf power from being applied to the channel unless the antenna coupler is functioning properly. The control circuitry within the antenna couplers also prevents more than one antenna coupler at a time from being tuned since all antenna couplers share the same power attenuator and tune reflectometer.

From the rf relay assembly, the rf signal enters the associated antenna coupler, which consists of an input matching network and input link assembly and a two-resonator bandpass filter. During tuning, the resonators of the bandpass filter are each tuned to resonance and the coupling between output resonator and output link is adjusted to load the antenna coupler. When the tuning procedures have been accomplished in the prescribed manner, a highly selective bandpass circuit is created and the input impedance of the antenna coupler matches the impedance of the rf line from the transmitter. This permits the antenna coupler to transfer efficiently the rf signal from the associated transmitter to the antenna while minimizing the interference between transmitters.

An output coupling link in the equipment cabinet delivers the rf signal from the output resonator to the combining network of the four-channel combiner. The combiner establishes the proper impedances to permit the four antenna coupler (channel) outputs to be combined and delivered to the antenna.

The tuning of each antenna coupler is controlled by the TUNE/OPERATE switch and three variable controls (FREQ ADJUST INPUT, FREQ ADJUST OUTPUT, and OUTPUT COUPLING) on the front panel. The TUNE/OPERATE switch controls the sequence of tuning and operation of the antenna coupler. The FREQ ADJUST INPUT control adjusts the input resonator variable capacitor to tune the input resonator. The FREQ ADJUST OUTPUT control adjusts the output resonator variable capacitor to tune the output resonator. The OUTPUT COUPLING control adjusts the coupling between the output resonator and the output link to load the antenna coupler.

For the tuning and operation of the antenna coupler, the forward component of the transmitter power is continuously monitored and displayed on the RF POWER FORWARD meter on the front panel;the relative input resonator voltage and the reflected component of the transmitter power are monitored and displayed on the RF POWER REFLECTED meter. The reflected power and the output resonator voltage are continuously monitored by the control circuitry which opens the transmitter interlock circuit to shut down the transmitter and antenna coupler if either the reflected power or output resonator voltage become excessive. The NORMAL indicator on the front panel lights to indicate that the antenna coupler is being tuned and operated in the proper manner. If the tuning procedures are not followed correctly, or a malfunction occurs within the channel, the NORMAL indicator will go out and the RETUNE indicator will light. When a "RETUNE" condition exists, the control circuits shut down the antenna coupler and associated transmitter. The operator must take corrective action and retune the antenna coupler in the prescribed manner.

Heat generated in the antenna coupler group is removed by cooling fans located in each antenna coupler drawer. These fans provide forced air across the input and output resonators, output link, combiner, and power attenuator. The cooling air flow is monitored by an air flow sensor in each antenna coupler drawer. When the cooling air becomes inadequate, the AIR FLOW and RETUNE indicators on the front panel light, the audible ALARM on the power supply panel sounds, and the loss-of-air-flow control circuits open the transmitter interlock circuit to shutdown the antenna coupler and associated transmitter. The audible ALARM can be turned off by pressing the ALARM SILENCER switch on the power supply panel, but the AIR FLOW and RETUNE indicators on the particular antenna coupler will remain lit and the transmitter interlock will remain open until corrective action is taken.

In an emergency, the protective circuits (excessive vswr, overvoltage, and loss of air flow) can be bypassed by operating the EMERGENCY-ON/OFF switch on the front panel of the antenna coupler. This closes the transmitter interlock circuit and permits the antenna coupler to continue to operate in an emergency mode.

3.3 OPERATING PROCEDURES

The operating procedures for Antenna Coupler Groups AN/SRA-56, -57 and -58 are identical and are based on the tuning and operation of a single antenna coupler within the group. All antenna couplers are tuned and operated in the same sequence and manner. The differences between antenna coupler groups, or between antenna couplers,because of the frequency ranges over which they operate do not affect the operating procedures in any manner.

These procedures also apply to eight-channel configurations of the equipment. Each antenna coupler group can be treated individually except that the restriction on frequency separation must be observed. Do not attempt to tune any antenna coupler within 5 percent of the operating frequency to which any of the remaining seven channels are tuned.

WARNING

Stay well away from the output link assemblies at all times. This equipment is designed to permit maintenance during operation and, if an antenna coupler drawer is removed from the cabinet for maintenance, the output link is accessible. When a transmitter is operating through ANY antenna coupler in the group, ALL output link assemblies contain extremely high rf voltages that may be fatal if personal contact is made.

3.3.1 Controls and Indicators

The controls and indicators required for operation are conatined on the power supply panel and on the front panel of the individual antenna couplers. The controls and indicators on the power supply panel are illustrated in figure 3-1 and described in table 3-1. The controls and indicators on the front panel of the antenna coupler are illustrated in figure 3-2 and discribed in table 3-2. The controls and indicators are identical for all power supply panels used in all the three groups. The controls and indicators for all antenna couplers in all three groups are also identical, except for the frequency indicating dials which are calibrated for the frequency range of the associated antenna coupler group.

3.3.2 Sequence of Operation

The sequence of operation presented in the following paragraphs defines the steps required to tune, operate, and secure any antenna coupler (channel) wihtin Antenna Coupler Groups

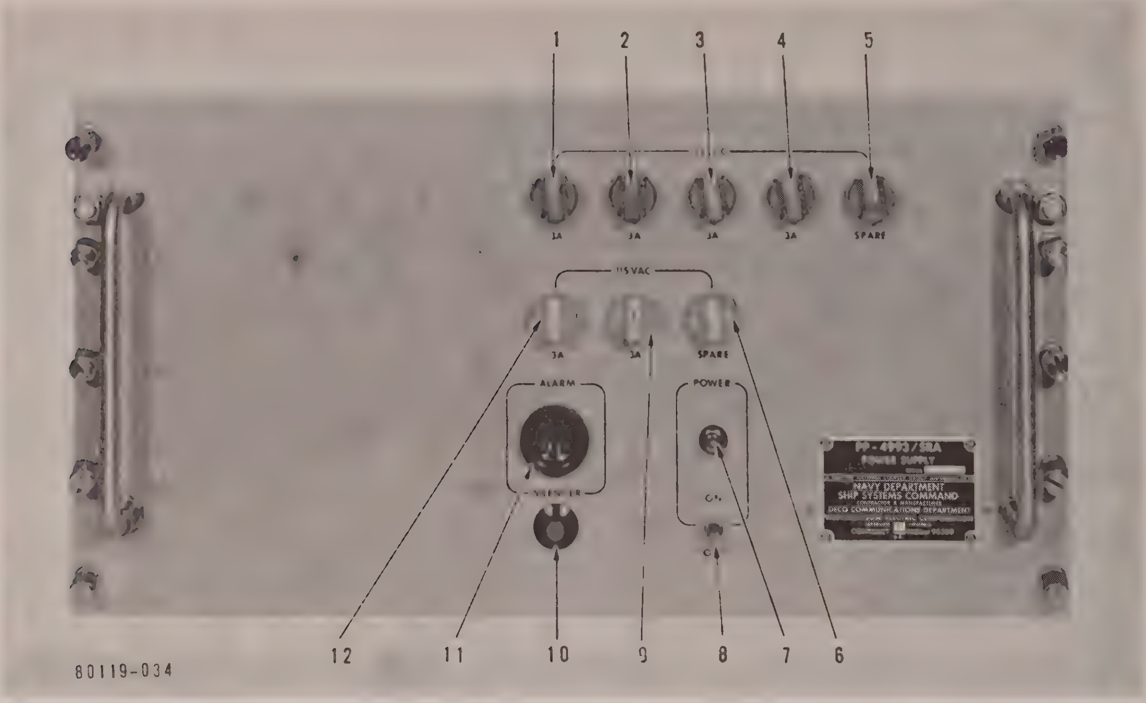
1
2
3
4
5
3A
3A
3A
3A
SPARE
115 VAC
3A
3A
SPARE
ALARM
POWER
ON
PP-4993/SRA
POWER SUPPLY
NAVY DEPARTMENT
SHIP SYSTEMS COMMAND
DECO COMMUNICATIONS DEPARTMENT
12
11
10
9
8
7
6
80119-034

Figure 3-1 Power Supply Panel, Controls and Indicators

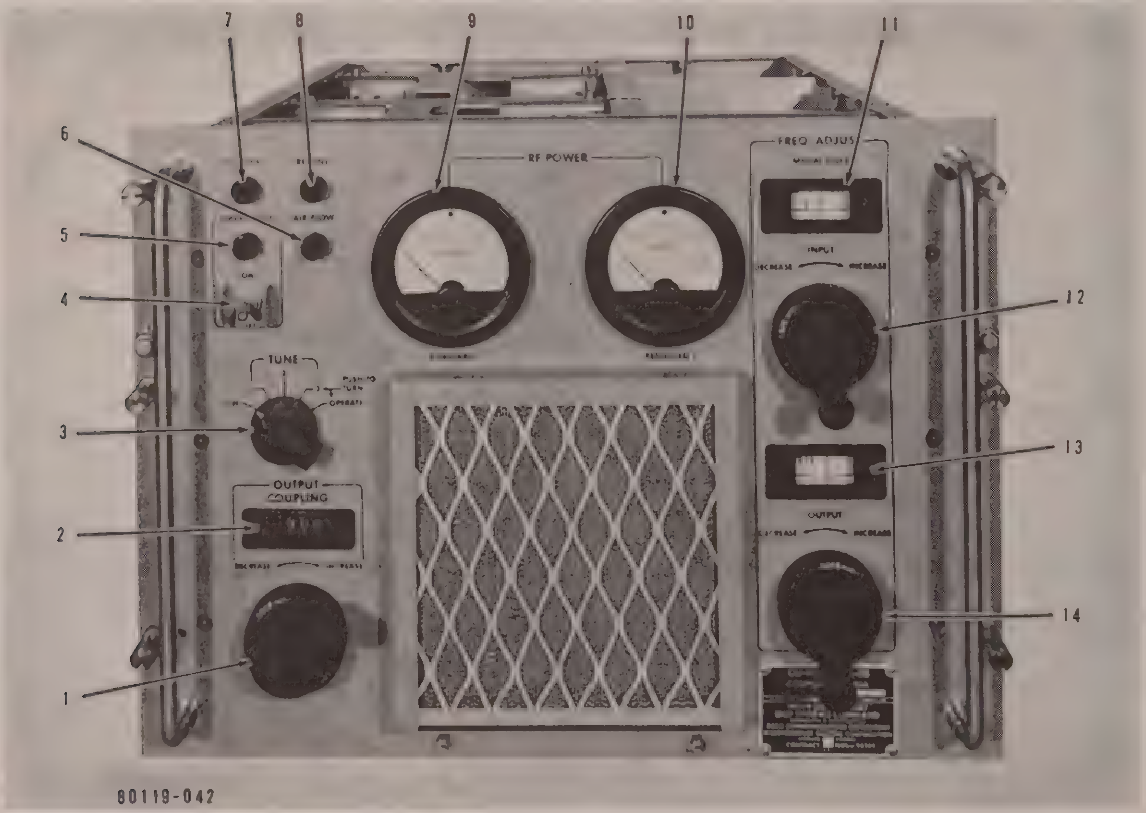
7
8
9
10
11
6
5
4
3
2
1
12
13
14
RF POWER
FREQ ADJUS
AIR FLOW
ON
INPUT
DECREASE
INCREASE
TUNE
PUSH TO TURN
OPERATE
OUTPUT COUPLING
DECREASE
INCREASE
OUTPUT
DECREASE
INCREASE
80119-042

Figure 3-2 Antenna Coupler, Controls and Indicators

TABLE 3-1 POWER SUPPLY PANEL CONTROLS AND INDICATORS

INDEX	CONTROL OR INDICATOR	FUNCTION
1	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A1 from overloads, and indicator that lights (amber) when fuse blows.
2	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A2 from overloads, and indicator that lights (amber) when fuse blows.
3	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A3 from overloads,and indicator that lights (amber) when fuse blows.
4	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A4 from overloads, and indicator that lights (amber) when fuse blows.
5	35VDC-SPARE fuse and indicator	Three-ampere fuse with indicator assembly for use as a spare to items 1 through 4 as required.
6	115VAC-SPARE fuse and indicator	Three-ampere fuse with indicator assembly for use as a spare to items 9 and 12 as required.
7	POWER lamp	Amber neon lamp that lights to indicate that primary power (115vac) is applied to the power supply panel 1A5 when the POWER-ON/OFF switch is in the ON position.
8	POWER-ON/OFF switch	Two-position toggle switch that controls the application of primary power (115vac) to the power supply panel 1A5.
9	115VAC-3A fuse and indicator	Three-ampere fuse that protects one side of the primary power (115vac) input circuit to the power supply panel 1A5 from overloads, and indicator that lights (white) when fuse blows.
10	ALARM SILENCER switch	Pushbutton switch that deactivates the audible ALARM when switch is depressed.
11	ALARM sonic generator	Audible alarm that provides a 2800 cps tone if the air flow in any antenna coupler in the group becomes inadequate.
12	115VAC-3A fuse and indicator	Three-ampere fuse that protects other side of the primary power (115 vac) input circuit to the power supply panel 1A5 from overloads, and indicator that lights (white) when fuse blows.

TABLE 3-2 ANTENNA COUPLER CONTROLS AND INDICATORS

INDEX	CONTROL OR INDICATOR	FUNCTION
1	OUTPUT COUPLING control	Rotary control that adjusts the inductive coupling between the output resonator and output link. DECREASE/INCREASE panel markings indicate the direction that the OUTPUT COUPLING control must be rotated to decrease or increase the output coupling. LOCK/UNLOCK dial permits the control to be secured in any desired position.
2	OUTPUT COUPLING dial	Three-digit rotary counter that indicates the relative position of the output link with respect to the output resonator, and therefore, the relative degree of coupling.
3	TUNE/OPERATE switch	Five-position rotary switch that controls the sequence of tuning and operation, the selection of control and monitoring devices, and the application of protective elements as required to tune and operate the antenna coupler.
	OFF switch position	Deactivates control and monitoring circuits and opens the transmitter interlock circuit to prevent rf from being applied to the antenna coupler.
	TUNE-1 switch position	Establishes the conditions for tuning the input resonator by closing the transmitter interlock circuit, energizing the associated rf relay to switch the transmitter rf into the power attenuator, connecting the operate reflectometer to the RF POWER FORWARD meter for monitoring the forward transmitter power, and connecting the input resonator voltage sensor to the RF POWER REFLECTED meter for monitoring the maximum input resonator voltage during tuning.
	TUNE-2 switch position	Establishes the conditions for tuning the output resonator by maintaining the same conditions as in TUNE-1 position and removing short from output resonator. RF POWER REFLECTED meter monitors minimum input resonator voltage during tuning.
	TUNE-3 switch position	Establishes the conditions for adjusting the output coupling by maintaining the same conditions as in TUNE-2 position, but connecting the tune reflectometer to the RF POWER REFLECTED meter for monitoring of low-level reflected rf power during adjustment of output coupling and final tuning.
	PUSH TO TURN switch position	Interrupts transmitter keyline to remove transmitter rf from antenna coupler while switching from tune to operate or operate to tune conditions.

TABLE 3-2 ANTENNA COUPLER CONTROLS AND INDICATORS (Continued)

INDEX	CONTROL OR INDICATOR	FUNCTION
3 (Cont'd.)	OPERATE switch position	Establishes the conditions for operation of the antenna coupler by deenergizing the rf relay to switch the transmitter rf directly into the antenna coupler, and connecting the operate reflectometer to the RF POWER REFLECTED meter for monitoring of high-level reflected rf power during operation.
4	EMERGENCY-ON/OFF switch	Two-position toggle switch that bypasses protective circuits activated during a cooling system failure, overvoltage, or excessive vswr to permit the antenna coupler to operate in an emergency mode.
5	EMERGENCY lamp	Red lamp that lights to indicate that protective circuits are bypassed when EMERGENCY-ON/OFF switch is in the ON position.
6	AIRFLOW lamp	Red lamp that lights when the cooling air flow within the antenna coupler is inadequate.
7	NORMAL lamp	Green lamp that lights to indicate that the antenna coupler is being tuned or operated satisfactorily.
8	RETUNE lamp	Red lamp that lights when the antenna coupler must be retuned because of improper tuning procedures, equipment drift, malfunction in the rf circuit, or inadequate air flow within the antenna coupler.
9	RF POWER FORWARD meter	Microammeter with scale from 0 to 1.5 kw that indicates the forward power component of the transmitter rf signal applied to the antenna coupler during tuning and operation.
10	RF POWER REFLECTED meter	Microammeter with scale from 0 to 250 watts that indicates the relative voltage of the input resonator when the TUNE/OPERATE switch is in TUNE-1 and TUNE-2 positions, the relative, low level reflected power component of the rf signal when the TUNE/OPERATE switch is in the TUNE-3 position, and the high-level reflected power component of the rf signal when the TUNE/OPERATE switch is in the OPERATE position.
11	FREQ ADJUST INPUT dial	Horizontally moving, flexible steel, tape dial calibrated from 1.9 to 6.4 mc (AN/SRA-56), 3.9 to 13.0 mc (AN/SRA-57) or 9.3 to 32.0 mc (AN/SRA-58) that indicates the frequency to which the input resonator is tuned.
12	FREQ ADJUST INPUT control	Rotary control that adjusts the resonant frequency of the input resonator. DECREASE/INCREASE panel markings indicate the direction that the FREQ ADJUST INPUT control must be rotated to decrease or increase the resonant frequency. LOCK/UNLOCK dial permits the control to be secured at any desired frequency.

TABLE 3-2 ANTENNA COUPLER CONTROLS AND INDICATORS (Continued)

INDEX	CONTROL OR INDICATOR	FUNCTION
13	FREQ ADJUST OUTPUT dial	Horizontally moving, flexible steel, tape dial calibrated from 1.9 to 6.4 mc (AN/SRA-56), 3.9 to 13.0 mc (AN/SRA-57) or 9.3 to 32.0 mc (AN/SRA-58) that indicates the frequency to which the output resonator is tuned.
14	FREQ ADJUST OUTPUT control	Rotary control that adjusts the resonant frequency of the output resonator, DECREASE/INCREASE panel markings indicate the direction that the FREQ ADJUST OUTPUT control must be rotated to decrease or increase the resonant frequency. LOCK/UNLOCK dial permits the control to be secured at any desired frequency.

AN/SRA-56, -57, or -58. These procedures are identical for the antenna couplers in all three antenna coupler groups.

Any antenna coupler can be tuned to any frequency within the frequency range of its associated antenna coupler group without regard to the sequence of operating frequecnies. Any antenna coupler can be tuned or operated at any power level (within its power rating) without regard to sequence or combination of power levels presented by other antenna couplers in the same antenna coupler group. However, at least 500 watts is required for each antenna coupler for optimum tuning and to provide protection of the antenna coupler and transmitter.

CAUTION

> If the required indication at any step in the procedures cannot be attained, rotate the TUNE/OPERATE switch to OFF and the OUTPUT COUPLING control in the maximum DECREASE direction to the stop, and notify maintenance personnel. Ensure that any trouble in the equipment has been corrected before continuing with the procedures.

3.3.2.1 Preliminary Checks, Adjustments, and Control Settings

Make the following checks, adjustments, and settings before attempting to tune or operate an antenna coupler:

Step 1. On antenna coupler to be tuned, rotate the TUNE/OPERATE swtich to OFF.

Step 2. Unlock and rotate OUTPUT COUPLING control in the DECREASE direction to the stop; OUTPUT COUPLING dial should indicate approximately 000.

Step 3. Check the other three antenna couplers in the group and ensure that the TUNE/OPERATE switch on each antenna coupler is set either to the OFF or to the OPERATE position.

Step 4. Ensure that the associated transmitter interlock and keyline circuits are correctly patched or connected to the antenna coupler being tuned.

Step 5. Ensure that the associated transmitter rf transmission line is correctly patched or connected to the antenna coupler being tuned.

Step 6. Ensure that the rf output of the associated antenna coupler group (or impedance matching network for an eight-channel configuration) is correctly patched or connected to the proper antenna (or terminated into the ships dummy antenna).

Step 7. Ensure that the transmitter operating frequency is separated at least 5 percent from the operating frequencies of all other antenna couplers in the coupler group or eight-channel configuration.

CAUTION

> Always preset the FREQ ADJUST INPUT and FREQ ADJUST OUTPUT controls before attempting to tune the antenna coupler. Do not adjust these controls across the operating frequency of another antenna coupler unless the TUNE/OPERATE switch on the antenna coupler being tuned is in the OFF position and the OUTPUT COUPLING control is in the maximum DECREASE position. RF from other antenna couplers may be coupled into the antenna coupler being tuned and damage the equipment.

Step 8. On the antenna coupler to be tuned, unlock and rotate the FREQ ADJUST INPUT control until the FREQ ADJUST INPUT dial indicates the same frequency as the transmitter.

Step 9. Unlock and rotate the FREQ ADJUST OUTPUT control until the FREQ ADJUST OUTPUT dial indicates the same frequency as the transmitter.

Step 10. Ensure that EMERGENCY-ON/OFF switch is in the OFF position.

Step 11. On the coupler group power supply panel, operate the POWER-ON/OFF switch to ON; POWER indicator should light and cooling fans in all antenna couplers in the group should operate.

Note

> POWER-ON/OFF switch should already be ON if another antenna coupler is operating through the coupler group.

3.3.2.2 Tuning Procedures

After the preliminary checks, adjustments, and settings have been accomplished, the antenna coupler is tuned in accordance with the procedures given below. Tune only one antenna coupler at a time. Follow these procedures carefully and in the exact sequence given. Any attempt to deviate from this sequence will activate the control and protective circuits within the antenna coupler and require the entire tuning procedure to be repeated from the beginning. This can only result in wasted time and effort.

CAUTION

> Rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING control in the maximum DECREASE direction to the stop if the RETUNE indicator lights during any step in the procedures. Before retuning the antenna coupler, ensure (1) that the AIR FLOW indicator is not lit and (2) that the operating frequency is greater than 5 percent from other antenna couplers in the group or configuration. Rotate TUNE/OPERATE switch to TUNE 1 and repeat the procedures from the beginning. If the RETUNE indicator lights again during the repeat procedures, secure the antenna

coupler in accordance with paragraaph 3.3.2.5 and notify manintenance personnel. (See paragraph 3.4 for emergency operation.)

Step 1. On antenna coupler being tuned, rotate TUNE/OPERATE switch to TUNE-1; NORMAL indicator must light.

Step 2. Energize the transmitter, and adjust the transmitter frequency and output power as required for operation. Power delivered to the antenna coupler must be at least 500 watts, but not more than 1000 watts average. RF POWER FORWARD meter must indicate approximately the same level as the output power of the transmitter.

CAUTION

> When the antenna coupler is in any of the tuning modes, do not operate the transmitter for extended periods of time beyond that required for tuning. Overheating and subsequent damage to the power attenuator may result. The power attenuator is not designed as a substitute for the ships dummy antenna.

Step 3. Carefully rotate the FREQ ADJUST INPUT control as required to obtain a maximum (peak) indication on the RF POWER REFLECTED meter. When this indication is attained, lock the control. No further adjustment of this control is required.

Step 4. Rotate TUNE/OPERATE switch to TUNE-2; NORMAL indicator must remain lit.

Step 5. Carefully rotate the FREQ ADJUST OUTPUT control as required to obtain a minimum (null) indication on the RF POWER REFLECTED meter.

Step 6. Rotate TUNE/OPERATE switch to TUNE-3; NORMAL indicator must remain lit, and RF POWER REFLECTED meter should deflect upscale.

Step 7. Carefully rotate the OUTPUT COUPLING control in the INCREASE direction to obtain again a minimum (null) indication on the RF POWER REFLECTED meter.

Step 8. Carefully rotate FREQ ADJUST OUTPUT control as required to obtain a new minimum (null) indication on RF POWER REFLECTED meter that is less than that obtained in step 7.

Step 9. Repeat steps 7 and 8 as required until RF POWER REFLECTED meter indicates a minimum as near zero as possible. When this indication is attained, proceed with step 10.

CAUTION

> In step 10, do not rotate TUNE/OPERATE switch to OPERATE unless the RF POWER FORWARD meter indication drops to zero. If meter indication is not attained, rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING control in the maximum DECREASE direction to the stop.

Step 10. Depress and hold the TUNE/OPERATE switch, RF POWER FORWARD meter must indicate zero.

Note

Transmitter will interrupt when TUNE/OPERATE switch is depressed. Depressing the switch opens the transmitter keyline to remove rf from the rf relay contacts when switching from the tune to operate mode or from operate to tune mode. Releasing the switch restores the rf power to the antenna coupler.

Step 11. Rotate TUNE/OPERATE switch to OPERATE and release the switch. NORMAL indicator must remain lit, RF POWER FORWARD meter must indicate transmitter output power, and RF POWER REFLECTED meter may deflect upscale.

Step 12. Very carefully rotate FREQ ADJUST OUTPUT and OUTPUT COUPLING controls as in steps 7 and 8 until RF POWER REFLECTED meter indicates a minimum as near zero as possible. When this indication is attained, lock both controls. The antenna coupler is now operational.

3.3.2.3 Normal Operating Procedures

All antenna couplers within the antenna coupler groups are basically passive devices. Once an antenna coupler has been tuned and becomes operational, it can be left unattended, except that the controls and indicators must be monitored periodically and adjusted occasionally to ensure that the antenna coupler operates with optimum performance. Although all controls and indicators are important, the RF POWER REFLECTED meter provides the indication that is most critical in determining the operational performance of the antenna coupler.

During operation, the reflected power component of the rf signal displayed on the RF POWER REFLECTED meter may shift due to variations in loading or effects of thermal drift. Load variations result from impedance changes caused by mutual coupling between closely spaced antennas aboard the ship, and the attitude of the associated antenna which changes according to the degree of pitch and roll of the ship. Thermal drift usually results from a temperature rise of the components in the input and output resonators of the bandpass filter or in the combiner. However, this effect will usually stabilize within 15 minutes after the antenna coupler becomes operational.

As long as the indication of the RF POWER REFLECTED meter remains near zero, no further actions is required. However, if the reflected power indication increases significantly, the antenna coupler FREQ ADJUST OUTPUT and OUTPUT COUPLING controls must be readjusted, to compensate for this increase.

Follow the procedures give below to monitor and adjust the equipment during operation:

Step 1. Periodically check the NORMAL and RETUNE indicators on the front panel of the antenna coupler; NORMAL indicator must be lit. If RETUNE indicator is lit, rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING control in the maximum DECREASE direction to the stop and repeat the entire tuning procedures from the beginning. Observe all warnings and cautions.

Step 2. Check the RETUNE, AIR FLOW, and EMERGENCY indicators; all of these indicators must be out during normal operation. If RETUNE and AIR FLOW indicators are lit, rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING in the maximum DECREASE direction to the stop; notify technician of trouble in the cooling fan or loss-of-air-flow circuits. If EMERGENCY indicator is lit, ensure that the antenna coupler is not required to operate in the emergency mode (see paragraph 3.4) and operate EMERGENCY-ON/OFF switch to OFF.

Step 3. Check the RF POWER FORWARD meter to ensure that the equipment is operating at the proper power level. RF POWER FORWARD meter must indicate approximately the initial operating power level of the transmitter. If the meter does not indicate this value, check the transmitter for drift or faulty circuits.

Step 4. Check the RF POWER REFLECTED meter to ensure that the reflected power of the rf signal has not increased significantly. If the RF POWER REFLECTED meter indication has increased significantly, proceed with step 5 to readjust the antenna coupler.

Note

> During the first 15 minutes of operation, thermal drift may cause the indication on the RF POWER REFLECTED meter to increase slightly. Check the RF POWER REFLECTED meter frequently during this interval, and perform the adjustments in steps 5 through 7 as required. After 15 minutes the antenna coupler will stabilize, and only periodic monitoring of indicators and adjustment of controls will be required.

Step 5. Unlock and very carefully rotate the OUTPUT COUPLING control as required to obtain a minimum (null) indication on the RF POWER REFLECTED meter.

Step 6. Unlock and very carefully rotate FREQ ADJUST OUTPUT control as required to reduce further the indication on the RF POWER REFLECTED meter.

Step 7. Repeat steps 5 and 6 as required until indication on RF POWER REFLECTED meter is as near zero as possible. When this indication is attained, lock both controls.

Note

> If RETUNE indicator lights during the adjustment procedure or an acceptable RF POWER REFLECTED meter indication cannot be attained, rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING control in the maximum DECREASE direction to the stop, and repeat the entire tuning procedure from the beginning. Observe all warnings and cautions.

3.3.2.4 Standby Operation

No special procedures are required to place the antenna coupler in standby operation. When the associated transmitter is placed in standby, the antenna coupler is automatically in standby. Leave the TUNE/OPERATE switch in OPERATE and do not adjust any of the controls. When the transmitter rf is reapplied, the antenna coupler will return to service instantly.

Note

> If the transmitter has been in standby for an extended time, the antenna coupler may require a 15 minute warm up period before the indication on the RF POWER REFLECTED meter returns to its operational point. Do not adjust any of the controls during this period unless the RF POWER REFLECTED meter indication exceeds 50 watts. After 15 minutes, periodically monitor indicators and adjust controls as under normal operating procedures (paragraph 3.3.2.3).

3.3.2.5 Securing Procedures

When the associated transmitter or the antenna coupler must be taken out of service, the antenna coupler is secured in the following manner:

Step 1. Deenergize the transmitter to remove rf power from the antenna coupler.

Step 2. Rotate TUNE/OPERATE switch to OFF.

Step 3. Rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop.

Step 4. If all four antenna couplers in the antenna coupler group have been secured, operate POWER-ON/OFF switch on the power supply panel to OFF.

Note

> In an emergency situation, any antenna coupler can be shut down immediately by rotating the TUNE/OPERATE switch to OFF. All four antenna couplers in the group can be shut down simultaneously by operating the POWER-ON/OFF switch on the power supply panel to OFF. Any associated transmitter will automatically shut down when the interlock line is opened. Continue to secure each antenna coupler by rotating the TUNE/OPERATE switch to OFF and the OUTPUT COUPLING control in the DECREASE direction to the stop.

3.4 SUMMARY OF OPERATING PROCEDURES

A summary of the operating procedures for Antenna Coupler Groups AN/SRA-56, -57, and -58 is presented in table 3-3.

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES

STEP	PROCEDURE	INDICATIONS OR PRECAUTIONS
GENERAL INSTRUCTIONS		
1	Read your instruction manual carefully.	WARNING Do not permit personnel or equipment to come in contact with any output link while any transmitter is operating through the coupler group. These links contain extremely high rf voltages that may be fatal if contacted.
2	Ensure that transmitter interlock keyline, and rf circuits are patached or connected to the associated antenna coupler and that output of antenna coupler group is patched or connected to the associated antenna.	
3	Do not attempt to tune or operate an antenna coupler within 5 percent of the frequency at which another antenna coupler within the group is already operating.	

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES (Continued)

STEP	PROCEDURE	INDICATIONS OR PRECAUTIONS
GENERAL INSTRUCTIONS (Continued)		
4	Tune only one antenna coupler at a time.	
5	Follow the tuning procedures in the exact sequence given.	
PRELIMINARY SETTINGS		
1	On antenna coupler being tuned, rotate TUNE/OPERATE switch to OFF.	
2	Rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop.	OUTPUT COUPLING dial should indicate approximately 000.
3	Ensure that the TUNE/OPERATE switch on all other antenna couplers is in the OFF or OPERATE position.	
4	On antenna coupler being tuned, rotate FREQ ADJUST INPUT and FREQ ADJUST OUTPUT controls until control dials indicate the desired operating frequency.	CAUTION Always preset tuning controls to the operating frequency before tuning the antenna coupler.
5	Operate EMERGENCY ON/OFF switch to OFF.	
6	If not already on, operate POWER ON/OFF switch on power supply panel to ON.	Power indicator should light. Cooling fans in all antenna couplers should operate.
TUNING PROCEDURES		
1	On antenna coupler, rotate TUNE/OPERATE switch to TUNE-1.	NORMAL indicator must light. CAUTION Rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING in the DECREASE direction to the stop if AIR FLOW or RETUNE indicator lights or ALARM sounds during the procedures. Correct the trouble and repeat entire tuning procedure from step 1. If RETUNE indicator lights during second tuning attempt, secure the antenna coupler and notify maintenance personnel.

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES (Continued)

STEP	PROCEDURE	INDICATIONS OR PRECAUTION
TUNING PROCEDURES (Continued)		
2	Tune and load transmitter at the desired operating frequency and bring transmitter output power up to at least 500 w, but not more than 1 kw average.	RF POWER FORWARD meter must indicate transmitter power level. CAUTION Do not operate the transmitter through the antenna coupler for extended periods while antenna coupler is in the tune mode.
3	Carefully rotate FREQ ADJUST INPUT control to obtain required indication. Lock control.	RF POWER REFLECTED meter should indicate a maximum level (peak).
4	Rotate TUNE/OPERATE switch to TUNE-2.	NORMAL indicator must remain lit.
5	Carefully rotate FREQ ADJUST OUTPUT control to obtain required indication.	R F POWER REFLECTED meter should indicate a minimum level (null).
6	Rotate TUNE/OPERATE switch to TUNE-3.	NORMAL indicator must remain lit and RF POWER REFLECTED meter may deflect upscale.
7	Rotate OUTPUT COUPLING control in the INCREASE direction to obtain required indication.	RF POWER REFLECTED meter should indicate a minimum level (null).
8	Rotate FREQ ADJUST OUTPUT control to obtain required indication.	RF POWER REFLECTED meter should indicate a minimum level, (null) less than in step 7.
9	Repeat steps 7 and 8 as necessary to obtain required indication.	RF POWER REFLECTED meter should indicate a minimum level (null) as near zero as possible.
10		CAUTION Do not rotate TUNE/OPERATE switch to OPERATE if RF POWER FORWARD meter does not drop to zero. Rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING in the DECREASE direction to the stop. Notify maintenance personnel.

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES (Continued)

STEP	PROCEDURE	INDICATIONS OR PRECAUTIONS
TUNING PROCEDURES (Continued)		
10 (Cont.)	Depress and rotate TUNE/OPERATE switch to OPERATE. Release switch.	NORMAL indicator must remain lit and RF POWER REFLECTED meter may deflect upscale. Transmitter will interrupt momentarily.
11	Very carefully adjust OUTPUT COUPLING and FREQ ADJUST OUTPUT controls as required to obtain indication.	RF POWER REFLECTED meter should indicate as near zero as possible.
12	Lock OUTPUT COUPLING and FREQ ADJUST OUTPUT controls.	Antenna coupler is now operational.
OPERATING PROCEDURES		
1	Periodically monitor all meters and indicators. Notify maintenance personnel if any indicator (except that on RF POWER REFLECTED meter) is not as specified. If indication on RF POWER REFLECTED meter has increased significantly, perform step 2.	NORMAL indicator must be lit; all other indicators must be out. RF POWER FORWARD meter must indicate approximately the same level as in step 2 of the tuning procedures. RF POWER REFLECTED meter should indicate approximately the same level as in step 11 of the tuning procedures.
2	Unlock OUTPUT COUPLING and FREQ ADJUST OUTPUT controls and very carefully adjust these controls as required to obtain indication.	RF POWER REFLECTED meter should indicate as near zero as possible.
SHUTDOWN AND SECURING PROCEDURES		
1	Deenergize the associated transmitter.	RF POWER FORWARD meter should indicate zero.
2	Rotate TUNE/OPERATE switch to OFF.	
3	Rotate OUTPUT COUPLING control in DECREASE direction to the stop.	
4	If all four antenna couplers in the group have been secured, operate POWER-ON/OFF switch on power supply panel to OFF.	

3.5 EMERGENCY OPERATION

Each antenna coupler is provided with an EMERGENCY-ON/OFF switch that permits the antenna coupler to operate under certain emergency conditions. During normal operation, the antenna coupler is protected by circuits that open the transmitter interlock to remove the rf power from the antenna coupler if the cooling air within the antenna coupler is inadequate (loss of air flow), excessively high rf voltage is present on the output resonator (overvoltage), or excessive rf power is reflected toward the transmitter (excessive vswr). When any of these three conditions occurs, the RETUNE indicator lights, and the antenna coupler must be retuned. If the fault condition is in the cooling system, the AIR FLOW indicator also lights and the audible ALARM on the power supply panel sounds.

When it is necessary in an emergency to operate the antenna coupler under any of these conditions, the protective circuits can be bypassed by operating the EMERGENCY-ON/OFF switch to ON. The antenna coupler can then be retuned in the normal manner. However, reduced power should be used, if possible, and front panel meters carefully monitored for indications of abnormal operation.

To operate the antenna coupler in the emergency mode, proceed in the following manner.

CAUTION

> When possible under the particular circumstances, limit the emergency operation of the antenna coupler to the shortest time necessary in order to minimize the damage that may result from operation in this mode for extended periods. During emergency operation, monitor the equipment frequently. As soon as possible, secure the antenna coupler, and repair before restoring to normal service.

Step 1. Rotate TUNE/OPERATE switch to OFF.

Step 2. Unlock and rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop.

Step 3. Rotate TUNE/OPERATE switch to TUNE-1. If the fault condition is in the air flow system and the audible ALARM sounds, depress ALARM SILENCER switch on power supply panel to silence the alarm. AIR FLOW indicator will remain lit.

Step 4. Operate EMERGENCY-ON/OFF switch to ON; EMERGENCY indicator must light, NORMAL indicator must light and RETUNE light must go out.

Step 5. Follow normal tuning and operating procedures given in paragraphs 3.3.2.2 and 3.3.2.3 except as noted below.

Note

> If the emergency mode is required because of a fault in the air flow system, the AIR FLOW indicator will remain lit throughout the procedures.

Note

> During the operation of the antenna coupler under emergency conditions, the indication on the RF POWER REFLECTED meter may not remain near zero. In this case, tune the antenna coupler for the minimum possible value. During operation in the emergency mode, frequently monitor all controls and indicators as in normal operation and, when required, adjust OUTPUT COUPLING and FREQ ADJUST OUTPUT controls to maintain a minimum value on the RF POWER REFLECTED meter.

3.6 OPERATORS MAINTENANCE

To ensure proper operation of the antenna coupler groups, it is necessary to perform routine checks when coming on watch and during operation of the equipment so that minor defects that may occur can be readily corrected. Refer to the maintenance schedule in Section 5 for the routine checks required.

Become familiar with the technical details of the equipment in order to recognize the appearance of minor defects and to correct such defects when trained maintenance personnel are not available. Correction of these minor defects may prevent the occurrence of major failures at a later time.

3.6.1 Replacement of Indicator Lamps and Fuses

Occasionally it will be necessary to replace indicator lamps and fuses that may fail during the operation of the equipment. To replace indicator lamps in the antenna coupler front panel or power supply panel, simply unscrew the defective lamp and screw appropriate replacement lamp into the receptacle. To replace any of the fuses in the power supply panel, rotate the fuse holder one-half turn and remove from panel. Replace the fuse within the fuse holder, insert the fuse holder into the panel, and rotate one-half turn.

CAUTION

> Do not replace fuse with one having a higher rating than the original. Notify maintenance personnel if the replacement fuse blows when power is restored to the circuit.

SECTION 4

TROUBLESHOOTING

4.1 LOGICAL TROUBLESHOOTING

During the operational life of any piece of equipment, faults, malfunctions, breakdowns, and component failures will occur. In order that corrective action may be made in the shortest possible time, a logical troubleshooting procedure and testing routine is required to aid in the rapid recognition of a fault or malfunction, the localization of the malfunctioning unit, and the determination of the location of the faulty stage or component in the equipment. The logical approach to troubleshooting is based on the six following steps.

4.1.1 Symptom Recognition

This is the first step in the troubleshooting procedure and is based on a complete knowledge and understanding of equipment operating characteristics. All equipment troubles are not the direct result of component failure. Therefore, a trouble in an equipment is not always easy to recognize since all conditions of less than peak performance are not always apparent. This type of equipment trouble is usually discovered while accomplishing preventive maintenance procedures (see paragraph 5.2). It is important that the "not so apparent" troubles, as well as the apparent troubles, be recognized.

4.1.2 Symptom Elaboration

After an equipment trouble has been "recognized", all the available aids designed into the equipment should be used to further elaborate on the original trouble symptom. Use of front panel controls and indicators should provide better identification of the original trouble symptom. Also, checking or otherwise manipulating the operating controls may eliminate the trouble.

4.1.3 Listing Probable Faulty Function

The next step in logical troubleshooting is to formulate a number of "logical choices" as to the cause and likely location (functional section) of the trouble. The "logical choices" are mental decisions which are based on knowledge of the equipment operation, a full identification of the trouble symptom, and information contained in this manual. The overall functional description and its associated block diagram (figure 4-22) should be referred to when selecting faulty functional sections.

4.1.4 Localizing the Faulty Function

For the greatest efficiency in localizing trouble, the functional sections which have been selected by the "logical choice" method should be tested in an order that will require the least time. This requires a mental selection to determine which section to test first. The selection should be based on the validity of the "logical choice" and the difficulties in making the necessary tests. If the tests do not prove that functional section to be at fault, the next selection should be tested, and so on until the faulty functional section is located. As aids in this process, the manual contains a functional description and servicing block diagrams (figures 4-23 through 4-25 for the major functional sections. Indications are included at significant check points on servicing block diagrams to aid in isolating the faulty section. Also, test data (such as information on control settings and critical adjustments) is supplied to augment the functional description and servicing block diagram for each functional section.

4.1.5 Localizing Trouble to the Circuit

After the faulty functional section has been isolated, it is often necessary to make additional "logical choices" as to which group of circuits or circuit (within the functional section) is at fault. Servicing block diagrams for each major functional section and individual functional circuit groups (when required) provide the signal flow and test location information needed to bracket and then isolate the faulty circuit. Functional descriptions, circuit descriptions, simplified schematics, and pertinent test data for individual circuits or groups of circuits comprising the functional section are all placed together in one area of the manual. Insofar as is practicable, this information is contained on facing or adjoining pages. Information which is too lengthy in nature to be included in this arrangement is readily referenced from the test data portion of the troubleshooting information.

4.1.6 Failure Analysis

After the trouble (faulty component, misalignment, etc.) has been located, but prior to performing corrective action, the procedures followed up to this point should be reviewed to determine exactly why the fault affected the equipment in the manner it did. This review is usually necessary to make certain that the fault discovered is actually the cause of the malfunction, and not just the result of the malfunction.

4.2 OVERALL FUNCTIONAL DESCRIPTION

Antenna Coupler Groups AN/SRA-56 (2 to 6 mc), AN/SRA-57 (4 to 12 mc) and AN/SRA-58 (10 to 30 mc) are functionally identical except for the differences in rf circuitry and components required to obtain the individual frequency ranges over which each coupler group operates. Because of this, the descriptions and diagrams throughout this section apply to all three coupler groups. Where functional and electrical differences occur, these differences are specifically noted by the use of formal AN nomenclature. The circuits that comprise the individual channels within a coupler group are also identical in function. For convenience, the discussion of the overall equipment considers only the circuits involved in processing the signal from one transmitter (transmitter 1) through one channel (channel 1), but it also applies to any channel when the proper reference designations are assigned to the associated operate reflectometer and antenna coupler. (See paragraph 6.1 for an explanation of reference designations used.)

An overall functional block diagram of Antenna Coupler Groups AN/SRA-56, -57 and -58 is shown in figure 4-22. Each coupler group cabinet contains four channels that enable four 1-kw (average) transmitters to operate simultaneously into a common broadband antenna. The circuits that form these four channels and the auxiliary circuits required to operate the channels are physically contained in a single equipment cabinet that houses one complete coupler group. Two AN/SRA-56 or AN/SRA-57 coupler groups can be combined into an eight-channel configuration using a separate impedance matching network.

The rf signals from an individual transmitter through a coupler group into an antenna are processed in the following manner (refer to figure 4-21).

RF power from transmitter 1 enters the coupler group through operate reflectometer 1A6A2 and is fed to rf relay assembly 1A6A7. During the tuning procedure for the associated antenna coupler (1A1), vacuum relays in the rf relay assembly are activated and the rf signal path is switched through power attenuator 1A6A1 and tune reflectometer 1A6A6. The attenuated rf is fed to rf circuitry in antenna coupler 1A1 where it is used to tune the antenna coupler before the full rf power is switched by the rf relays and applied directly to the antenna coupler input during regular operation. The operate and tune reflectometers sample the rf power and provide signal outputs to the monitoring and control circuits during tuning and operation of the antenna coupler.

From the rf relay assembly, either the attenuated rf used in tuning, or the full power rf used in regular operation, is applied to a highly selective bandpass filter in antenna coupler 1A1 through electronic Q control assembly 1A1A4. The processed rf output from the bandpass filter is inductively coupled to the combiner by means of an output coupling link 1A6L1 which is physically moved in and out of the output resonator to load the antenna coupler during the final tuning step and operation.

The rf voltages present on the input and output resonators are sampled to provide additional signal inputs to the monitoring and control circuits of the antenna coupler during tuning and operation. The rf circuits, operational controls, monitoring, and control circuits provide a means of tuning the antenna coupler in the required sequence, operating the antenna coupler in an established manner, and protecting the antenna coupler and its associated transmitter if a malfunction should occur.

In the combiner, the rf output from channel 1 is matched and combined with the rf outputs from the other three channels in the coupler group cabinet. The rf output of the combiner is fed via coaxial transmission line to the antenna, or directly to an impedance matching network when two coupler group cabinets are used in an eight-channel configuration (AN/SRA-56 and AN/SRA-57 only). The impedance matching network operates in a manner similar to the combiner to match and combine the rf outputs from the two coupler groups. The rf output from the impedance matching network is then delivered to the antenna via coaxial transmission line.

The power distribution and supply circuits located on the power supply panel 1A5 provide to each antenna coupler (1) ac to operate the cooling fans which remove the heat generated during operation and (2) dc to operate the control and protective circuits. The power supply panel also contains an audible alarm to warn the operator of a loss-of-air flow within any of the antenna couplers.

4.3 FUNCTIONAL SECTION DESCRIPTION

The following paragraphs present a detailed description of the functional sections that comprise a coupler group. The descriptions are limited to a discussion of the functional operation of each section, a brief circuit analysis of the section, and test data useful in troubleshooting the equipment.

Detailed circuit descriptions are provided only for unique circuits; refer to NAVSHIPS 0967-000-0120 Electronics Installation and Maintenance Book for a detailed description of the conventional circuits used in this equipment.

Test data in tabular form is presented for each functional section and major circuit in the coupler group. These tables contain information that will aid in isolating the fault to the defective unit, circuit, and component when used in accordance with the Handbook of Test Methods and Practices NAVSHIPS 0967-000-0103.

4.3.1 Operate Reflectometer 1A6A2, 1A6A3, 1A6A4, 1A6A5

Each coupler group contains four operate reflectometers, one for each channel. All operate reflectometers in all three coupler groups are identical in function and circuitry. These units are completely interchangeable between channels or groups.

4.3.1.1 Functional Description

The operate reflectometer samples the rf power through a channel to develop two dc outputs that are proportional to the forward and reflected components of the rf power. The rf power from the transmitter is essentially unaffected by the operate reflectometer.

The dc signal developed by the forward rf power component is connected continuously to the RF POWER FORWARD meter on the associated antenna coupler for monitoring during tuning and operation. The dc signal developed from the reflected rf power component is connected continuously to a control circuit in the associated antenna coupler to operate the protective circuit that opens the transmitter interlock if the reflected rf power (vswr) becomes excessive (see paragraph 4.3.5.3.4.7). The dc output of the reflected rf component is also applied to the RF POWER REFLECTED meter on the antenna coupler when the TUNE/OPERATE switch is in the OPERATE position to permit the reflected power to be monitored visually during operation.

4.3.1.2 Circuit Description

A simplified schematic of the operate reflectometer is shown in figure 4-1. RF power from the transmitter passes directly through the reflectometer from J1 to J2. The reflectometer samples the rf currents and voltages present on the transmission line inner conductor, compares the samples obtained, and rectifies the resultant voltage to produce the two dc outputs. The current sample is obtained from the coils of toroidal transformer T1 through which the center conductor of the coaxial transmission line passes. The voltage sample is obtained from the center conductor by two capacitive voltage dividers C1, A1C1, A1C2, and C2, A2C1, A2C2.

If there is no reflected power, all of the transmitter rf passes from J1 to J2. The current induced in the coils of transformer T1 by the forward power develops reference voltages across R1 and R2. The junction of R1 and R2 is placed at rf ground by capacitor A2C4 and acts as a reference point (common) for the two circuits. (However, this point floats above dc ground; see paragraph 4.3.5.3.4.7.) Forward rf power in the direction from J1 to J2 results in a voltage across R1 that is 180° out of phase with the voltage sample produced by the capacitive voltage divider C1, A1C1, A1C2, and the voltages at the terminals of diode A1CR1 are of opposite polarity. Diode A1CR1 conducts during the half cycle that the voltage across the capacitive voltage divider is negative with respect to the voltage across R1, but does not conduct during the half cycle when the voltage across the voltage divider is positive with respect to that across R1. The positive voltage developed during the latter half cycle causes a current to flow through resistors A1R1 and A2R1 to the common side of the circuit through RF POWER FORWARD meter M1, and meter M1 indicates the proportional value of forward rf power. Resistor A1R1 is a current limiting resistor and resistor A2R1 is variable to permit the circuit to be calibrated; capacitor A2C3 filters the rectified signal and acts as an rf ground return.

When only forward rf power flows from J1 to J2, the voltage across resistor R2 is in phase with the voltage developed by capacitive voltage divider C2, A2C1, A2C2, and the voltages at the terminals of diode A2CR1 are of the same polarity. During calibration, capacitor A2C2 is adjusted so that the voltage amplitudes at the terminals of diode A2CR1 are also equal. Under these conditions, diode A2CR1 does not conduct; thus, no dc is developed to drive the reflected-power circuit.

When reflected rf power flows from J2 to J1, the conditions are reversed. The sampled rf voltages at the terminals of diode A2CR1 are 180° out of phase, and diode A2CR1 conducts on half-cycles to produce a positive voltage at the cathode of A2CR1. This dc voltage is applied through inductor A2L1 and resistor A2R2 to the antenna coupler control circuit which monitors the reflected power and operates to open the transmitter interlock circuit if the reflected power becomes excessive (see paragraph 4.3.5.3.4.7). The dc voltage is also applied to the RF POWER REFLECTED meter M2 through resistor R24 on the circuit control board A1 in the antenna coupler and TUNE/OPERATE switch A6S1 when switch A6S1 is in the OPERATE position. Inductor A2L1 is used between A2CR1 and A2R2 rather than a resistor to decrease the dc path resistance (while maintaining a high rf impedance) so that more dc current will flow through M2 at the voltage available. Capacitor A2C5 filters the dc signal by acting as the rf ground return, resistor A2R2 is variable to permit the circuit to be calibrated; and resistor A1R24 in the antenna coupler acts as a precision calibration resistor for the meter circuit.

If only reflected rf power is present and flows from J2 to J1, the voltage across resistor R1 is in phase with the voltage developed across capacitive voltage divider C1, A1C1, A1C2, and the voltages at the terminals of diode A1CR1 are of the same polarity. During alignment and calibration, capacitor A1C2 is adjusted so that the voltage levels at the terminals of diode A1CR1 are equal. Under these conditions, diode A1CR1 does not conduct and thus no dc is developed to drive the forward power circuit.

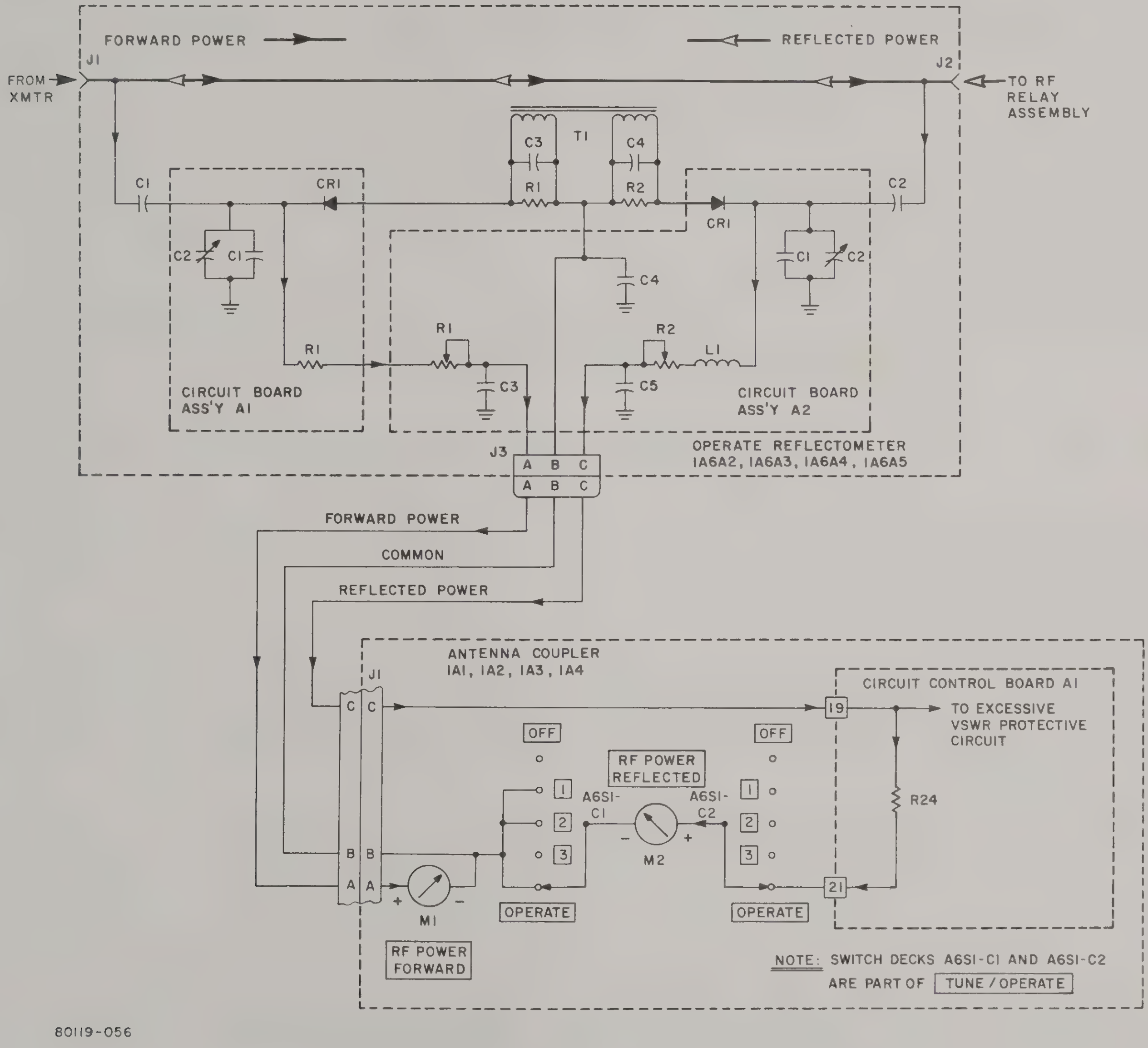
FORWARD POWER
REFLECTED POWER
J1
J2
FROM XMTR
TO RF RELAY ASSEMBLY
T1
C3
C4
R1
R2
C1
CR1
C2
CR1
C2
C1
C1
C2
C4
R1
R1
R2
L1
C3
C5
CIRCUIT BOARD ASS'Y A1
CIRCUIT BOARD ASS'Y A2
OPERATE REFLECTOMETER 1A6A2, 1A6A3, 1A6A4, 1A6A5
J3
A B C
A B C
FORWARD POWER
COMMON
REFLECTED POWER
ANTENNA COUPLER 1A1, 1A2, 1A3, 1A4
J1
C C
B B
A A
CIRCUIT CONTROL BOARD A1
19
TO EXCESSIVE VSWR PROTECTIVE CIRCUIT
R24
21
OFF
OFF
RF POWER REFLECTED
1
2
3
1
2
3
A6S1-C1
A6S1-C2
M2
M1
OPERATE
OPERATE
RF POWER FORWARD
NOTE: SWITCH DECKS A6S1-C1 AND A6S1-C2 ARE PART OF TUNE/OPERATE
80119-056

Figure 4-1. Operate Reflectometer, Simplified Schematic Diagram

4.3.1.3 Test Data

The procedure for isolating a fault to the operate reflectometer consists of a logical choice based on observations of the RF FORWARD and RF REFLECTED power meters during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit or component consists of testing of individual components, continuity checks, and alignment and calibration procedures given in paragraph 5.2.2.3.1. Test information concerning the operate reflectometer is presented in table 4-1.

TABLE 4-1. TEST DATA FOR OPERATE REFLECTOMETER

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Input Impedance	50 ohms, nominal	RF circuit
Output Impedance	50 ohms, nominal	RF circuit
Insertion Loss	0 db	RF circuit
Frequency Range	2 to 30 mc	
Monitored Signal	Forward Power: 0 to 0.126 vdc measured between J3, pins A and B	For 0 to 1.5 kw forward power with no reflected power
	Reflected Power: 0 to 1.30 vdc measured between J3, pins C and B	For 0 to 250 watts reflected power with no forward power
TEST POINTS		
1 - J1 2 - J2	Insertion loss	0 db
3 - J3-A/B	Monitored forward power	Connect + lead to J3-A
4 - J3-C/B	Monitored reflected power	Connect + lead to J3-C
TEST EQUIPMENT		
Transmitter	1 kw average, 2 to 30 mc	On-board transmitter
Multimeter	AN/PSM-4D	Use to test continuity and for measuring dc voltage at J3
PERFORMANCE INDICATORS		
RF POWER FORWARD	Indicates power level of transmitter	Indicates in all positions of TUNE/OPERATE switch
RF POWER REFLECTED	Indicates near 0 when antenna coupler is properly tuned and coupled. May indicate to 250 watts if antenna coupler is not properly tuned and coupled.	TUNE/OPERATE switch in OPERATE

TABLE 4-1. TEST DATA FOR OPERATE REFLECTOMETER (Continued)

ITEM	CHARACTERISTICS	REMARKS
CRITICAL ADJUSTMENTS		
Forward Power Zero Set	A2C2	See paragraph 5.2.2.3.1
Reflected Power Zero Set	A1C2	See paragraph 5.2.2.3.1
Forward Power Calibration Adjustment	A2R1	See paragraph 5.2.2.3.1
Reflected Power Calibration Adjustment	A2R2	See paragraph 5.2.2.3.1
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	
Simplified Schematic Diagram	Figure 4-1	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figure 5-18	
Repair Procedures	Paragraph 5.3.1.4	
Alignment and Calibration Procedures	Paragraph 5.2.2.3.1	

4.3.2 RF Relay Assembly 1A6A7

Each coupler group cabinet contains one rf relay assembly used to reroute the rf signal path during tuning and operation. The rf relay assembly is identical in function and circuitry in all three coupler groups and is completely interchangeable between groups.

4.3.2.1 Functional Description

The rf relay assembly accepts the individual rf outputs from the operate reflectometers and transfers each output either directly to its associated antenna coupler during operation, or indirectly through the coupler group cabinet power attenuator and tune reflectometer into the antenna coupler during tuning of that antenna coupler. Protective circuitry in each antenna coupler prevents more than one channel from being transferred simultaneously to the power attenuator and tune reflectometer. Thus, only one antenna coupler at a time can be tuned.

4.3.2.2 Circuit Description

A simplified schematic diagram of the rf relay assembly is shown in figure 4-2. When vacuum relays K1 through K8 are in the deenergized condition, the transmitter rf signals from

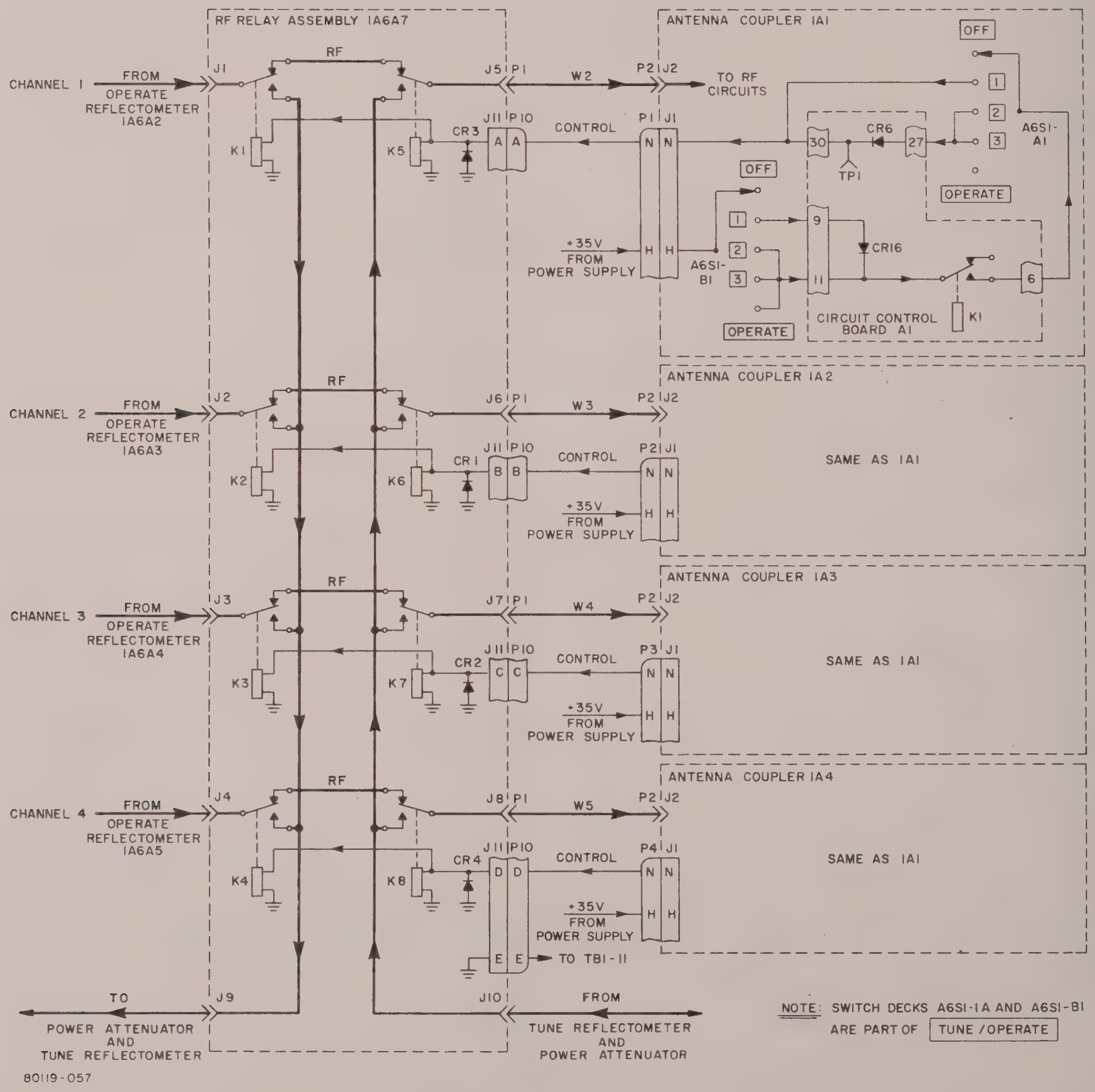
RF RELAY ASSEMBLY 1A6A7
ANTENNA COUPLER 1A1
OFF
CHANNEL 1
FROM OPERATE REFLECTOMETER 1A6A2
J1
RF
J5 P1
W2
P2 J2
TO RF CIRCUITS
1
2
3
A6S1-A1
J11 P10
CR3
CONTROL
P1 J1
K1
K5
A A
N N
30
CR6
27
TP1
OFF
OPERATE
+35V FROM POWER SUPPLY
H H
A6S1-B1
1
2
3
9
11
CR16
6
K1
CIRCUIT CONTROL BOARD A1
OPERATE
ANTENNA COUPLER 1A2
CHANNEL 2
FROM OPERATE REFLECTOMETER 1A6A3
J2
RF
J6 P1
W3
P2 J2
J11 P10
CR1
B B
CONTROL
P2 J1
K2
K6
N N
+35V FROM POWER SUPPLY
H H
SAME AS 1A1
ANTENNA COUPLER 1A3
CHANNEL 3
FROM OPERATE REFLECTOMETER 1A6A4
J3
RF
J7 P1
W4
P2 J2
J11 P10
CR2
C C
CONTROL
P3 J1
K3
K7
N N
+35V FROM POWER SUPPLY
H H
SAME AS 1A1
ANTENNA COUPLER 1A4
CHANNEL 4
FROM OPERATE REFLECTOMETER 1A6A5
J4
RF
J8 P1
W5
P2 J2
J11 P10
CR4
D D
CONTROL
P4 J1
K4
K8
N N
+35V FROM POWER SUPPLY
H H
E E
TO TB1-11
SAME AS 1A1
TO POWER ATTENUATOR AND TUNE REFLECTOMETER
J9
J10
FROM TUNE REFLECTOMETER AND POWER ATTENUATOR
NOTE: SWITCH DECKS A6S1-1A AND A6S1-B1 ARE PART OF TUNE/OPERATE
80119-057

Figure 4-2. RF Relay Assembly, Simplified Schematic Diagram

each operate reflectometer are delivered straight through the rf relay assembly to their associated antenna coupler. However, when an antenna coupler is being tuned, +35 volts is applied to the corresponding relay pair in the rf relay assembly, and the rf signal path is switched through the power attenuator and tune reflectometer, back to the rf relay assembly, and then to the antenna coupler.

Control relay A1K1 on the antenna coupler circuit control board (1A1A1, 1A2A1, 1A3A1 or 1A4A1) is normally energized when the TUNE/OPERATE switch is in any position but OFF and is held in the energized condition by self-latching contacts. Relay A1K1 will deenergize if a malfunction in the equipment occurs, improper tuning procedures are attempted, or if the inhibit circuit senses that another antenna coupler is already in the tune mode (see paragraph 4.3.5.3.4.1).

Plus 35 volts is applied to TUNE/OPERATE switch deck A6S1-B1 through pin H of receptacle J1 on the antenna coupler. Switch deck A6S1-B1 and the closed contacts of relay A1K1 transfer the +35 volt signal to switch deck A6S1-A1. The voltage is then applied to pin N of receptacle J1 when switch A6S1 is in TUNE-1, TUNE-2, or TUNE-3 positions. Note that the overall path is either through isolation diodes A1CR16 or A1CR6 which prevent conduction in any but the correct path. Test point A1TP1 on the control circuit board provides an access point to monitor the voltage level during troubleshooting.

The +35 volt signal is delivered from pin N of receptacle J1 on the individual antenna coupler to pins A, B, C, or D of receptacle J11 on the rf relay and to the corresponding pair of relays K1-K5, K2-K6, K3-K7, or K4-K8, respectively. When one of the relay pairs is energized, the rf path is switched so that the associated transmitter rf flows through J9, power attenuator and tune reflectometer and returns to the relay assembly through J10. Diodes CR1, CR2, CR3, and CR4 are transient suppression diodes connected across the paralleled coils of each relay. Pin E of rf relay receptacle J11 serves as the common dc return for the +35 volt signal that energizes the relay pairs. This pin is connected to the equipment ground at TB1-11.

4.3.2.3 Test Data

The procedure for isolating a fault to the rf relay assembly consists of a logical choice based on observations of the RF FORWARD and RF REFLECTED power meters during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit or component consists of testing of individual relays and diodes, and continuity checks of the various rf paths. Test information concerning the rf relay assembly is presented in table 4-2.

TABLE 4-2. TEST DATA FOR RF RELAY ASSEMBLY

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Input Impedance	50 ohms, nominal	RF circuit
Output Impedance	50 ohms, nominal	RF circuit
Insertion Loss	0 db	RF circuit
Resistance	0.04 ohms maximum	RF circuit measured from input to output

TABLE 4-2. TEST DATA FOR RF RELAY ASSEMBLY (Continued)

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS (Continued)		
Relay Coil Operating Voltage	+26.5 vdc	Relay circuit
Relay Coil Resistance	1300 ohms ±5% 650 ohms ±5%	Each coil Relay pair measured at J11
TEST POINTS		
5 - J1, J2, J3, J4	Continuity check	
6 - J5, J6, J7, J8	Continuity check	Relay deenergized
8 - J9	Continuity check	Relay energized
9 - J10	Continuity check	Relay energized
7 - J11-A/E, -B/E, -C/E, -D/E	Relay operation	Connect + lead to J11-A, B, C, or D
TEST EQUIPMENT		
Multimeter	AN/PSM-4D	Use to check continuity and resistance of rf and relay circuits
Power Supply	+35 vdc	Use to operate relay pairs
PERFORMANCE INDICATORS		
RF POWER FORWARD	Indicates power level of transmitter	Indicates in all positions of TUNE/ OPERATE switch
RF POWER REFLECTED	Indicates as specified in Section 3 (Operator's Handbook)	
Status Indicator	NORMAL	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	

TABLE 4-2. TEST DATA FOR RF RELAY ASSEMBLY (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Simplified Schematic Diagram	Figure 4-2	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figure 5-29	
Repair Procedures	Paragraph 5.3.1.5	

4.3.3 Power Attenuator 1A6A1

Each coupler group contains a single power attenuator used in tuning the individual antenna coupler. The power attenuators in all three coupler groups are identical and completely interchangeable between groups.

4.3.3.1 Functional Description

The power attenuator is used to provide a nonreactive, nominal 50-ohm load to the transmitter so that it will not be affected during the antenna coupler tuning process. During tuning, the power attenuator provides a nonreactive source of low-level rf power at a nominal 50 ohms to the input of the antenna coupler. This enables the antenna coupler characteristics to be adjusted to provide a low vswr impedance match between the antenna coupler input and the antenna connected to the combiner output.

4.3.3.2 Circuit Description

A simplified schematic diagram of the power attenuator is shown in figure 4-3. As shown in this figure, nine nonreactive resistors are arranged in series-parallel configuration to make up the attenuator. All resistors except R9 have a value of 25 ohms; resistor R9 has a value of 37.5 ohms to bring the network up to an input/output nominal impedance of 50 ohms. RF power from the transmitter is switched to input receptacle J1, attenuated approximately 16.7 db, and applied to output receptacle J2.

Each resistor is rated at 100 watts, and the power dissipation rating of the power attenutor is more than adequate for its designed function. However, the power attenuator is not designed to be used on a continuous basis to provide dummy load capabilities for testing other equipments, and such use should be prohibited.

The resistor assembly is cooled by directing the exhaust air from all four antenna couplers within a cabinet through the resistor assembly. Cooling capability will be reduced when an antenna coupler is removed from the cabinet for maintenance.

4.3.3.3 Test Data

The procedure for isolating a fault to the power attenuator consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters, status indicators, and transmitter during normal operation or during preventive maintenance checks

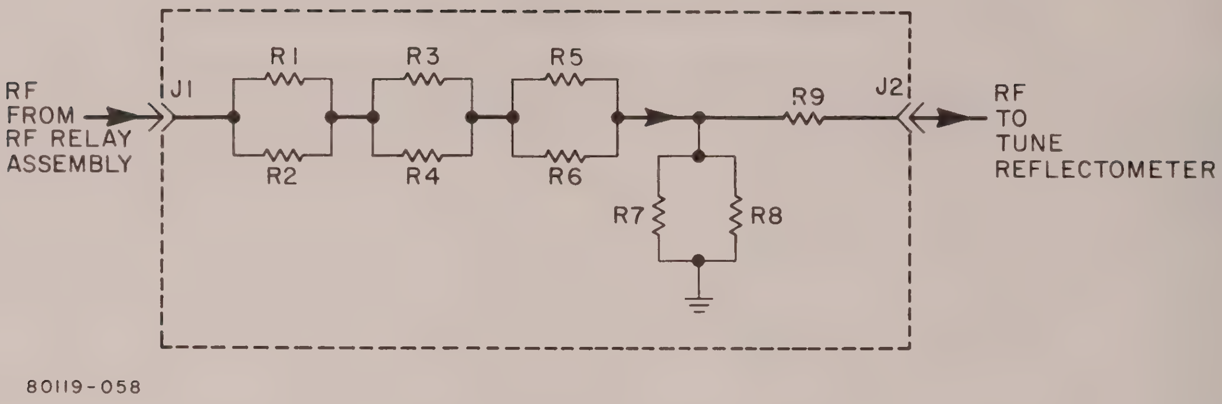

Figure 4-3. Power Attenuator, Simplified Schematic Diagram

(see paragraph 5.2). The process of isolating the fault to a particular component consists of testing of individual components and continuity checks. Test information concerning the power attenuator is presented in table 4-3.

TABLE 4-3. TEST DATA FOR POWER ATTENUATOR

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Input Impedance	50 ohms, nominal	
Output Impedance	50 ohms, nominal	
Attenuation	16.7 db	
Power Rating	1 kw average overall; 100 watts each resistor	Intermittent duty
Frequency Range	2 to 30 mc	
TEST POINTS		
10 - J1 11 - J2	Impedance	50 ohms nominal to ground 75 ohms between center conductors
	Attenuation	16.7 db
TEST EQUIPMENT		
Multimeter	AN/PSM-4D	Used in impedance and attenuation measurements

TABLE 4-3. TEST DATA FOR POWER ATTENUATOR (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS		
RF POWER FORWARD	Indicates same as transmitter power level	
RF POWER REFLECTED	Indicates as specified in Section 3 (Operator's Handbook)	
Status Indicator	NORMAL	
Transmitter	Normal operation during tuning procedures	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	
Simplified Schematic Diagram	Figure 4-3	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figure 5-27	
Repair Procedures	Paragraph 5.3.1.3	

4.3.4 Tune Reflectometer 1A6A6

Each coupler group contains one tune reflectometer used in tuning and loading the individual antenna couplers. The tune reflectometers in all three coupler groups are identical in function and circuitry, and are completely interchangeable between groups.

4.3.4.1 Functional Description

The tune reflectometer samples the rf power between the power attenuator and the antenna coupler and generates a dc output that represents the reflected component of the rf power. When the TUNE/OPERATE switch is in the TUNE-3 position, the dc output signal is applied to the RF POWER REFLECTED meter M2 on the antenna coupler being tuned for monitoring of the reflected power during the final tuning step. The rf power passes through the tune reflectometer essentially unaffected.

The tune reflectometer is similar to the operate reflectometer except that it is more sensitive than the operate reflectometer and contains only those circuits required to sample the reflected component of the rf power. The tune reflectometer is not calibrated in reference to a particular power level, but is made as sensitive as practical to very low levels of reflected power. It also contains circuits that compress the upscale readings on the RF POWER REFLECTED meter to extend the range of reflected rf power that can be indicated on the meter, yet allow the meter to be fully effective at low levels.

4.3.4.2 Circuit Description

A simplified schematic of the tune reflectometer is shown in figure 4-4. Forward power passes from the power attenuator through the reflectometer from J1 to J2 to the antenna coupler via the rf relay assembly. RF power reflected back through the rf circuit passes through the tune reflectometer from J2 to J1. The reflectometer samples the current and voltage produced by the reflected power, compares the samples obtained, and rectifies and compresses the resultant voltage to produce the dc output. The current sample is obtained from the series-aiding coils of toroidal transformer T1 through which the center conductor of the coaxial transmission line passes. The voltage sample is obtained directly from the center conductor of the transmission line by capacitive voltage divider C1, C2, A1C1, A1C2.

When reflected power flows from J2 to J1, the current induced in the series-aiding coils of transformer T1 produces a reference voltage across resistors R1 and R2 connected in series to obtain greater sensitivity. The reference point for the circuit is established by capacitor A1C3 which places one end of resistor R1 at rf ground. The current sample voltage across series resistors R1 and R2 is 180° out of phase with the voltage sample produced by voltage divider C1, C2, A1C1, A1C2, and the voltages at the anodes and cathodes of parallel-connected diodes A1CR1, A1CR2 are of opposite polarity. Diodes A1CR1 and A1CR2 conduct during the half cycle that the voltage across the capacitive voltage divider is negative with respect to the voltage across resistors R1 and R2, but do not conduct when the voltage across the voltage divider is positive with respect to that across resistors R1 and R2. The positive voltage developed during the latter half cycle causes a current to flow to the return side of the circuit through choke A1L1, the TUNE/OPERATE switch A6S1 on the antenna coupler being tuned (when switch A6S1 is in the TUNE-3 position), and the RF POWER REFLECTED meter M2.

Inductor A1L1 provides a high reactance to the rf component at the junction of the diodes and the voltage divider, and a low resistance to the dc component. Capacitor A1C4 filters the dc signal to eliminate rf from being applied to A1Q1 and the metering circuit. Transistor A1Q1 with its base tied to the collector acts as a variable shunt across meter M2. As the voltage between pins C and B on receptacle J3 rises, transistor A1Q1 conducts harder to shunt a portion of the dc current around the meter. This results in a compression of the meter scale at high levels of reflected power since the dc current is no longer proportional to the reflected power sampled.

When no reflected, but only forward power is present, the polarity of the voltage produced by the current sample is reversed. Thus, forward rf power flowing from J1 to J2 induces a current in the coils of transformer T1 to develop a voltage across R1 and R2 that is in phase with the voltage across voltage divider C1, C2, A1C1, A1C2. The voltages at the anodes and cathodes of parallel diodes A1CR1-A1CR2 are of the same polarity. During alignment, capacitor A1C2 is adjusted so that the voltages at the terminals of the diodes are also equal. Under these conditions, diodes A1CR1 and A1CR2 do not conduct; thus no dc is developed to drive the reflected power circuit.

4.3.4.3 Test Data

The procedure for isolating a fault to the tune reflectometer consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters during

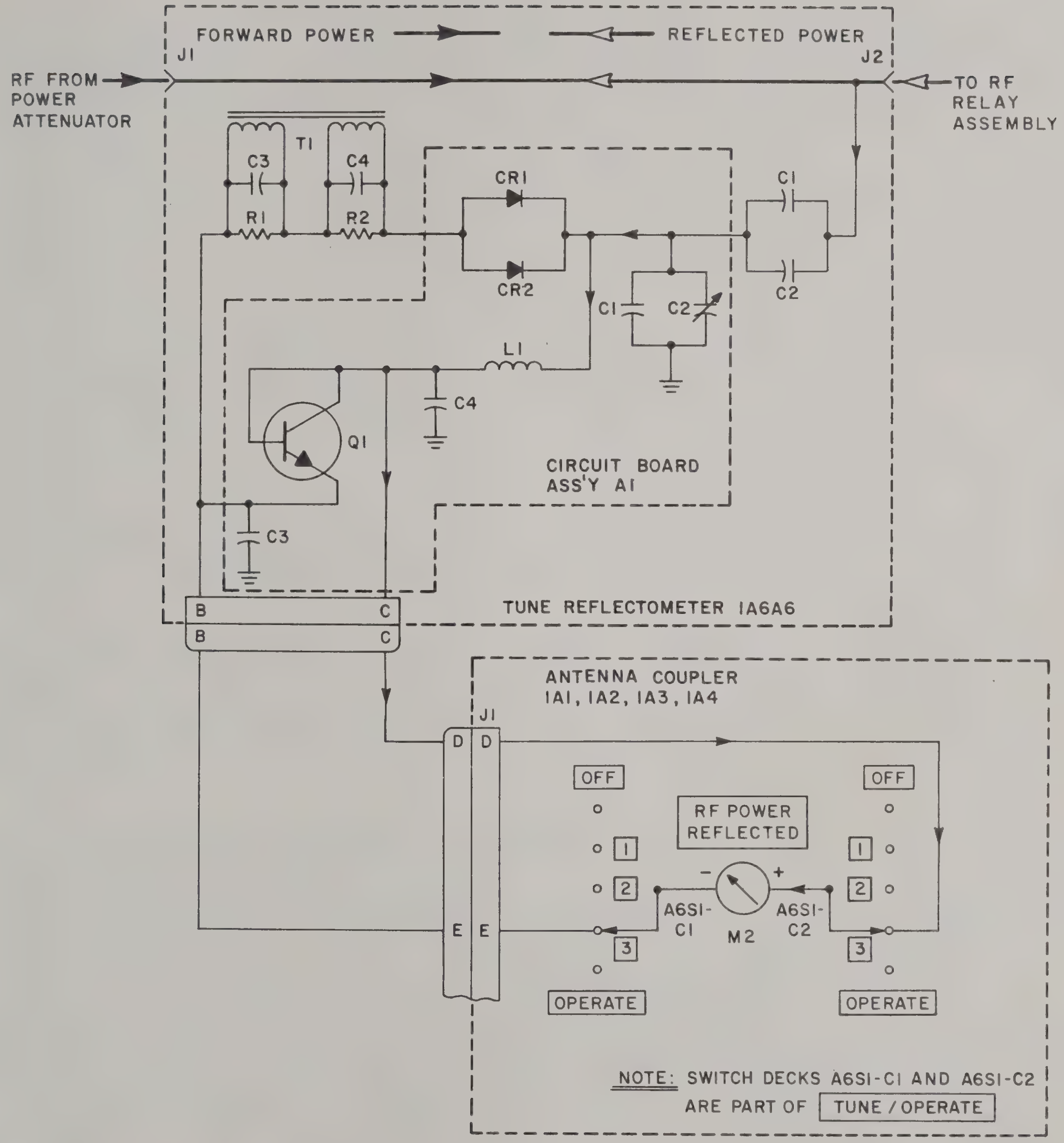
FORWARD POWER
REFLECTED POWER
J1
J2
RF FROM POWER ATTENUATOR
TO RF RELAY ASSEMBLY
T1
C3
C4
R1
R2
CR1
CR2
C1
C2
C1
C2
L1
C4
Q1
C3
CIRCUIT BOARD ASS'Y A1
B
C
B
C
TUNE REFLECTOMETER 1A6A6
ANTENNA COUPLER 1A1, 1A2, 1A3, 1A4
J1
D
D
E
E
OFF
OFF
RF POWER REFLECTED
1
2
3
1
2
3
A6S1-C1
A6S1-C2
M2
OPERATE
OPERATE
NOTE: SWITCH DECKS A6S1-C1 AND A6S1-C2 ARE PART OF TUNE / OPERATE

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Figure 4-4. Tune Reflectometer, Simplified Schematic Diagram

normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit or component consists of testing of individual components, continuity checks, and calibration and adjustment procedures given in paragraph 5.2.2.3.2. Test information concerning the tune reflectometer is presented in table 4-4.

TABLE 4-4. TEST DATA FOR TUNE REFLECTOMETER

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Input Impedance	50 ohms, nominal	RF circuit
Output Impedance	50 ohms, nominal	RF circuit
Insertion Loss	0 db	RF circuit
Frequency Range	2 to 30 mc	
Monitored Signal	Reflected power - 0 to 0.130 vdc measured between J3 pins B and C	For 0 to 25 watts reflected power with no forward power, indicates as 250 watts on RF POWER REFLECTED meter
TEST POINTS		
12 - J1 13 - J2	Insertion loss	0 db
14 - J3-C/B	Monitored reflected power	Connect + lead to J3-C
TEST EQUIPMENT		
Transmitter	1 kw average, 2 to 30 mc	On-board transmitter
Multimeter	AN/PSM-4D	Use to test continuity and for measuring dc voltage at J3
PERFORMANCE INDICATORS		
RF POWER FORWARD	Indicates power level of transmitter	Indicates in all positions of TUNE/OPERATE switch
RF POWER REFLECTED	Indicates near 0 when antenna coupler is properly tuned and coupled. May indicate to 250 watts if antenna coupler is not properly tuned and coupled	TUNE/OPERATE switch in TUNE-3
CRITICAL ADJUSTMENTS		
Reflected Power Zero Set	A1C2	See paragraph 5.2.2.3.2
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	

TABLE 4-4. TEST DATA FOR TUNE REFLECTOMETER (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Servicing Block Diagram	Figure 4-23	
Simplified Schematic Diagram	Figure 4-4	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figure 5-19	
Repair Procedures	Paragraph 5.3.1.4	
Alignment Procedures	Paragraph 5.2.2.3.2	

4.3.5 Antenna Coupler 1A1, 1A2, 1A3, 1A4

4.3.5.1 Overal Functional Section Description

Each coupler group cabinet contains four separate antenna couplers, one for each channel. Each antenna coupler provides the circuitry required to process the rf signals from its associated transmitter safely and efficiently with a minimum of interference between channels. All antenna couplers within a coupler group are physically and functionally identical and are completely interchangeable within that coupler group. However, the position of the antenna coupler within the equipment cabinet does affect some of the operating parameters of the antenna coupler (see paragraph 5.2.1.4).

A functional block diagram of the antenna coupler is shown in figure 4-22. As shown in this figure each antenna coupler consists of four functional sections: rf circuits, operational controls, monitoring circuits and control circuits. The rf circuits contain the components required for the transfer, filtering, and matching of rf power from the transmitter while preventing the flow of significant power towards that transmitter from other transmitters operating through the same coupler group. The operational controls consist of the front panel controls used to tune and operate the antenna coupler. The monitoring circuits contain the front panel indicators used in tuning and operating the antenna coupler, and sensors that provide signals to the indicating devices and control circuits. The control circuits consist of circuits that process the signals from the monitoring circuits and external operate and tune reflectometers, provide and enforce sequential tuning, and operate the protective circuits as required to protect the antenna coupler, coupler group, and transmitter from damage due to a malfunction or maladjustment of the equipment. These functional sections are described in detail in the circuit descriptions that follow.

4.3.5.2 Overall Functional Section Test Data

The procedures for isolating a fault to an individual antenna coupler consists of a logical choice based on observations of the antenna coupler RF POWER FORWARD and RF POWER REFLECTED meters, control settings, and status indicators, and on the performance of the associated transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular functional section within the antenna coupler consists of additional logical choices based on the front panel controls and indicators, test procedures in Section 5, and a thorough knowledge of the individual circuits comprising the functional section. Test information concerning the overall performance of the antenna coupler is presented in table 4-5.

TABLE 4-5. OVERALL PERFORMANCE TEST DATA FOR ANTENNA COUPLER

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Frequency Range	2 to 6 mc	Antenna Coupler CU-1772 used with Antenna Coupler Group AN/SRA-56
	4 to 12 mc	Antenna Coupler CU-1774 used with Antenna Coupler Group AN/SRA-57
	10 to 30 mc	Antenna Coupler CU-1776 used with Antenna Coupler Group AN/SRA-58
Bandwidth	Greater than 12 kc	
Tuning Control	Manual	
Input Impedance	50 ohms, nominal	
Output Impedance	50 ohms, nominal	Will match 3 to 1 vswr load to 50 ohm input
Input VSWR	1.05 to 1	For up to 3 to 1 vswr load
Insertion Loss	Less than 1.8 db	Measured through combiner
RF Power Rating	1 kw average, 2 kw p-e-p	
AC/DC Power Requirements	115 vac	Operates cooling fan
	35 vdc	Operates control circuits
TEST INFORMATION		
RF Circuits	Relative measurement of insertion loss	See paragraph 5.2.1.5.2
	Worst case 3 to 1 vswr load check	See paragraph 5.2.1.5.3
	Detailed measurement of insertion loss	See paragraph 5.2.1.5.5
	Measurement of isolation	See paragraph 5.2.1.5.6
Monitor and Control Circuits	Control system check	See paragraph 5.2.1.5.1
	Control system calibration	See paragraph 5.2.1.5.4

TABLE 4-5. OVERALL PERFORMANCE TEST DATA FOR ANTENNA COUPLER (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS		
RF POWER FORWARD	As specified by Section 3 (Operator's Handbook)	
RF POWER REFLECTED	As specified by Section 3	
Status Indicators	NORMAL	
AIR FLOW Indicator	Off	
Transmitter	Operates normally	
CRITICAL ADJUSTMENTS		
FREQ ADJUST INPUT	As specified by Section 3	
FREQ ADJUST OUTPUT	As specified by Section 3	
OUTPUT COUPLING	As specified by Section 3	Varies depending upon operating frequency and position of antenna coupler within the coupler group (see paragraph 5.2.1.4).
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	

4.3.5.3 Circuit Descriptions

4.3.5.3.1 RF Circuits

The rf circuits consists of those circuits required to transfer the rf signal from the associated transmitter to the combiner with a maximum efficiency while minimizing the effects of spurious radiation, noise, and interference from other transmitters operating through the same coupler group.

A simplified schematic diagram of the rf circuits is shown in figure 4-5. The rf signal is applied to the rf section of the antenna coupler from the rf relay assembly through rf cables. The rf section consists of an electronic Q control assembly link-coupled to a two-resonator bandpass filter. The rf energy is inductively coupled from the input link assembly to the input resonator, from the input resonator to the output resonator, and from the output resonator to the output coupling link. Although the output link that transfers the rf signal out of the antenna coupler is physically and functionally part of the combiner, it moves in and out of the antenna coupler to establish the degree of coupling required to achieve a low vswr impedance matching between the transmitter and the connected antenna.

4.3.5.3.1.1 Electronic Q Control Assembly 1A1A4, 1A2A4, 1A3A4, 1A4A4

The electronic Q control assembly consists of a reactive network that automatically compensates for the increase in the input resonator efficiency as the resonator is tuned from its low frequency limit towards the high frequency limit. It accomplishes this by providing an additional loading effect on the resonator as the frequency rises, while maintaining the input impedance as seen at the input connector at a nominal 50 ohms when the channel is properly tuned and coupled. This network eliminates the need for an additional tuning control to adjust the coupling between the input link and the input resonator.

The operation of the electronic Q control is functionally identical in all three coupler groups, but the values and configurations of capacitors and inductors that comprise the network depend upon the frequency ranges covered by the associated antenna couplers. These differences are illustrated in the simplified schematic diagram in figure 4-6.

Each of the electronic Q control assemblies is an LC impedance-transformation network. As the frequency increases, these networks permit more of the load resistance to be coupled into the bandpass filter resonators to maintain the input impedance at a nominal 50 ohms. This enables the Q of both the input and output resonators to remain relatively constant with frequency.

All electronic Q control assemblies within a coupler group are identical and completely interchangeable within that coupler group. The assembly is mounted on the exterior of the bandpass filter box to place it as near the input resonator as possible.

4.3.5.3.1.2 Bandpass Filter

The bandpass filter consists of an input and an output resonator mounted in the bandpass filter box (see figure 4-5). The rf output of the electronic Q control assembly is inductively coupled to the input resonator of the bandpass filter by a single-turn loop, input link assembly, L1, formed from 0.250 inch outside diameter copper tube with 0.030 inch wall.

The input resonator consists of a fixed inductor L2 and a vacuum tuning capacitor C3 mounted within the input resonator compartment of the bandpass filter box. The resonant frequency of the input resonator is variable, being controlled by front panel FREQ ADJUST INPUT control connected to tuning capacitor C3. The rf signal is inductively coupled from the input resonator to the output resonator. The output resonator is identical to the input resonator and consists of fixed inductor L3 and vacuum tuning capacitor C4 mounted within the output resonator compartment of the bandpass filter box. The resonant frequency of this resonator is also variable, being controlled by front panel FREQ ADJUST OUTPUT control connected to tuning capacitor C4.

The physical and electrical characteristics of the inductors and capacitors in the input and output resonators depends upon the frequency range covered by the antenna coupler and coupler group. The inductor assemblies for both the input and output resonators each consists of 9-1/2 turns of 0.357-inch outside diameter, 0.030-inch wall, copper tube having an inductance of 6.3 microhenries for Antenna Coupler CU-1772/SRA-56 (2 to 6 mc); 6 turns of 0.500-inch outside diameter, 0.040-inch wall copper tube having an inductance of 3.2 microhenries for CU-1774/SRA-57 (4 to 12 mc), and 3-1/2 turns of 0.625-inch outside diameter, 0.040-inch copper wall tube having an inductance of 1.1 microhenries for CU-1776/SRA-58 (10 to 30 mc). The tuning capacitors for each resonator are vacuum capacitors variable from 25 to 1000 pf and rated at 15 kv, 125 amperes for Antenna Coupler CU-1772/SRA-56 (2 to 6 mc); from 20 to 500 pf, rated at 15dv, 80 amperes for CU-1774/SRA-57 (4 to 12 mc); and from 10 to 300 pf, rated at 15 kv, 80 amperes for CU-1776/SRA-58 (10 to 30 mc).

The interior of the bandpass filter box common to both input and output resonator inductors is copper lined in the plane of maximum magnetic coupling to reduce the losses resulting from the heavy induced rf currents from the inductors, thereby obtaining higher resonator efficiencies. This copper lining constitutes a one-turn magnetic coupling loop linking both resonators. Capacitive coupling between the input and output resonators is inhibited by a Faraday shield placed approximately at the midpoint between the two resonators. The faraday shield is formed from a copper sheet electrically connected only to one side of the copper lining to prevent a conductive path across the lining.

The relative physical positions of the inductors with respect to the copper lining and to each other are critical since they control the mutual magnetic coupling between resonators. Fine adjustment of interresonator coupling is accomplished by two copper straps across the copper lining approximately midway between the resonators. These two straps, connected between the two copper-lined walls, form loops through which a portion of the current circulating through the copper walls is shunted. By varying the position of these straps, the coefficient of coupling between the input and output inductors can be controlled.

The bandpass characteristics of the filter and the impedance matching capabilities of the antenna coupler depend critically upon the Q of both the input and output resonators and the coefficient of coupling between them.

The rf signal is coupled out of the bandpass filter by means of an output coupling link 1A6L1, 1A6L2, 1A6L3, or 1A6L4 which is mechanically driven by the OUTPUT COUPLING control on the front panel of the antenna coupler. The output link (part of the combiner) is formed from two single-turn loops connected in parallel. The output link assembly moves in and out of the bandpass filter box to adjust the inductive coupling between the output resonator and output link. During tuning and operation, the position of the output link is set to obtain a low vswr impedance match between the coupler input and the antenna connected to the combiner output.

The bandpass filter box also contains voltage sensing and protective devices required for monitoring and protection of the rf section of the antenna coupler. Probes of the voltage sensors (A2 and A3), mounted on the exterior of the bandpass filter box, extend into the inductor compartment of the input resonator and into the tuning capacitor compartment of the output resonator. Voltage sensor A2,associated with the input resonator,supplies a dc voltage to the monitoring section for use in tuning the input and output resonators. Voltage sensor A3,associated with the output resonator,supplies a dc voltage to the control and protective sections used to protect the output resonator of the antenna coupler from excessive voltage.

As further protection, spark gaps between ground and the plates of the tuning capacitors in both resonators are provided to fire and shunt to chassis ground when excessive voltages are present on the capacitors. A solenoid-controlled shorting switch A5 located in the output resonator places a short across the plates of the output resonator tuning capacitor to completely detune the output resonator section of the antenna coupler and decouple it from the input resonator during certain tuning steps, as well as to protect the resonators from excessive voltage that could appear when the coupler was not in use and another antenna coupler in the group was set to operate at the same or an adjacent frequency.

4.3.5.3.1.3 Test Data

The procedure for isolating a fault to the rf circuit of the antenna coupler consists of a logical choice based on observations of the front panel controls and indicators and the performance

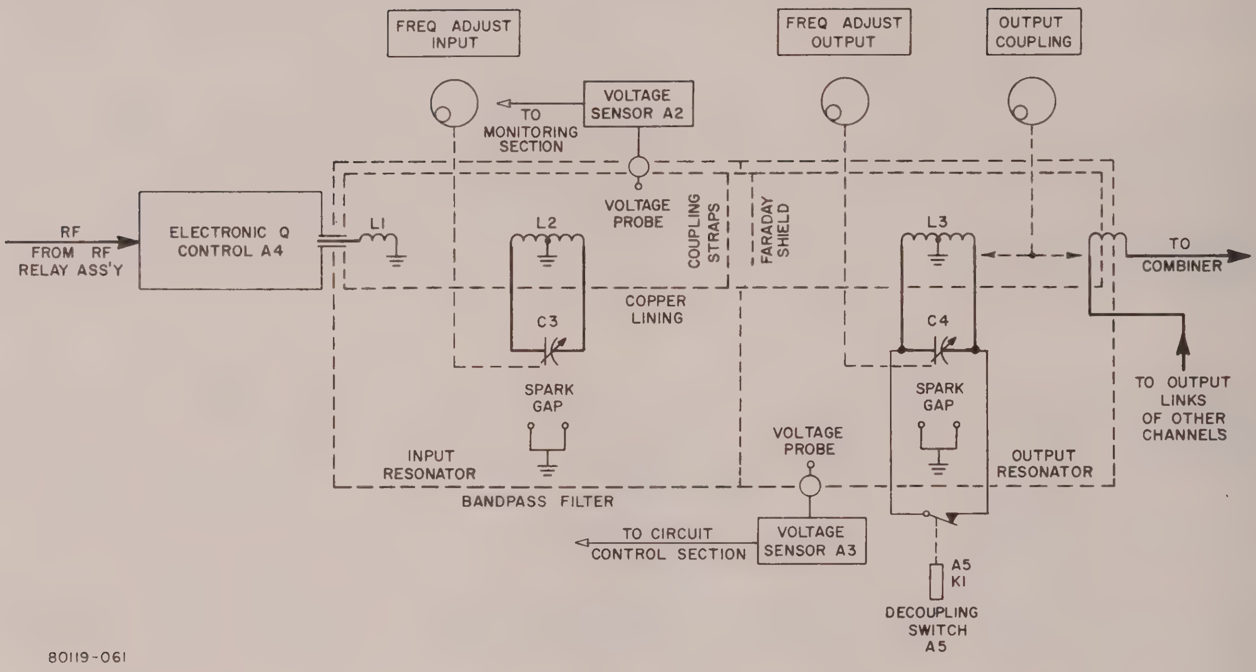
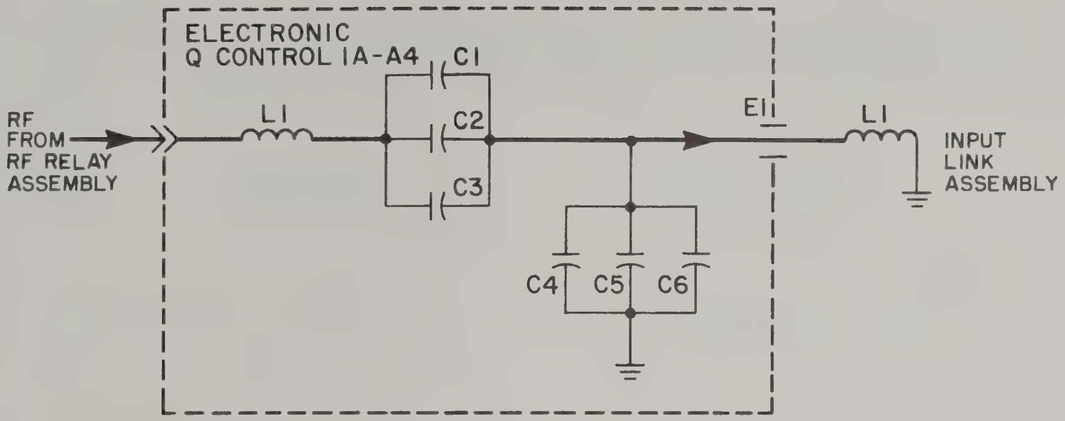

FREQ ADJUST INPUT
FREQ ADJUST OUTPUT
OUTPUT COUPLING
VOLTAGE SENSOR A2
TO MONITORING SECTION
RF FROM RF RELAY ASS'Y
ELECTRONIC Q CONTROL A4
L1
L2
VOLTAGE PROBE
COUPLING STRAPS
FARADAY SHIELD
L3
TO COMBINER
COPPER LINING
C3
C4
SPARK GAP
SPARK GAP
TO OUTPUT LINKS OF OTHER CHANNELS
INPUT RESONATOR
VOLTAGE PROBE
OUTPUT RESONATOR
BANDPASS FILTER
TO CIRCUIT CONTROL SECTION
VOLTAGE SENSOR A3
A5 K1
DECOUPLING SWITCH A5
80119-061

Figure 4-5 RF Circuit, Simplified Schematic Diagram

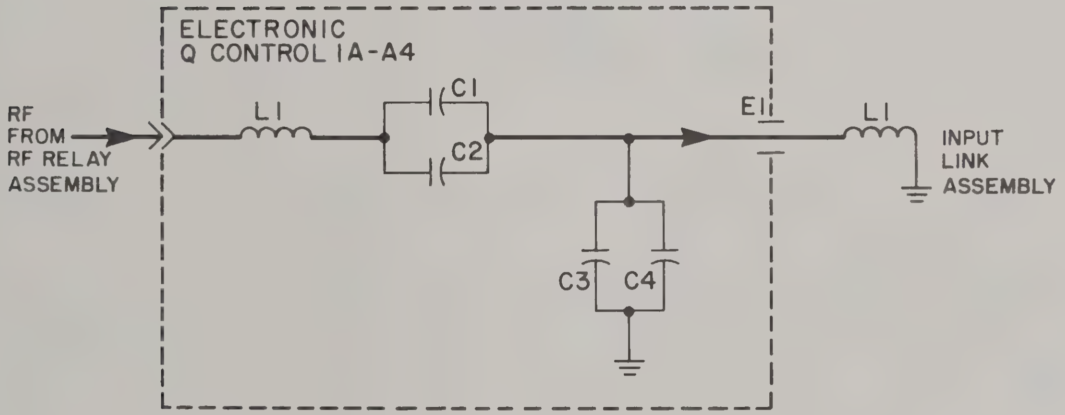
of the transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit or component consists of testing of individual components and the rf test procedures given in paragraph 5.2.1. Test information concerning the rf circuits is presented in table 4-6.

TABLE 4-6. TEST DATA FOR RF CIRCUITS

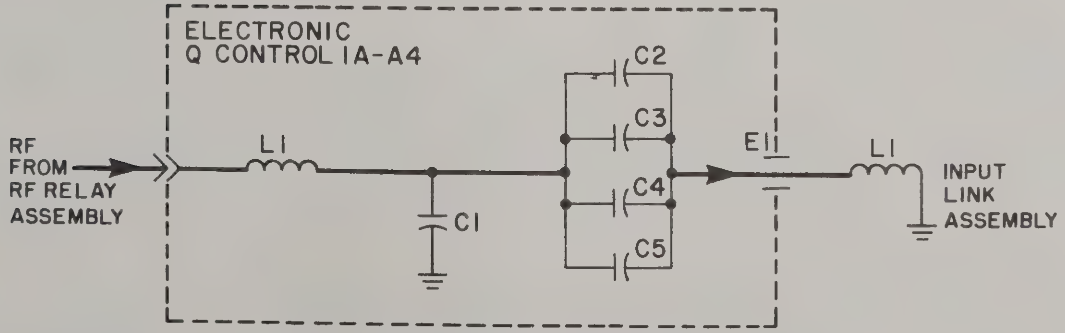
ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Input Impedance	50 ohms, nominal	
Output Impedance	50 ohms, nominal	
Insertion Loss	Less than 1.8 db	
RF Power Rating	1 kw average, 2 kw p-e-p	
Maximum Output Resonator Voltage	6.25 kilovolts	To trip protective circuit (see paragraph 4.3.5.3.4.7)
TEST POINTS		
15 - J1	Preventive maintenance procedures	See paragraphs 5.2.1.5.2, 5.2.1.5.3 and 5.2.1.5.5 for procedures


ELECTRONIC
Q CONTROL 1A-A4
RF
FROM
RF RELAY
ASSEMBLY
L1
C1
C2
C3
C4
C5
C6
E1
L1
INPUT
LINK
ASSEMBLY

ANTENNA COUPLER CU-1772/SRA-56


ELECTRONIC
Q CONTROL 1A-A4
RF
FROM
RF RELAY
ASSEMBLY
L1
C1
C2
C3
C4
E1
L1
INPUT
LINK
ASSEMBLY

ANTENNA COUPLER CU-1774/SRA-57


ELECTRONIC
Q CONTROL 1A-A4
RF
FROM
RF RELAY
ASSEMBLY
L1
C1
C2
C3
C4
C5
E1
L1
INPUT
LINK
ASSEMBLY

80119-062

ANTENNA COUPLER CU-1776/SRA-58

Figure 4-6 Electronic Q Control, Simplified Schematic Diagram

TABLE 4-6. TEST DATA FOR RF CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS (Continued)		
A - L2 B - C3 C - L3 D - C4	RF characteristics measurements and alignment	See paragraph 5.2.2.3.5 for procedures
TEST EQUIPMENT		
As specified in paragraphs 5.2.1.1, 5.2.1.2.2, 5.2.2.1 and 5.2.2.2.1		
PERFORMANCE INDICATORS		
RF POWER FORWARD	As specified in Section 3 (Operator's Handbook)	
RF POWER REFLECTED	As specified in Section 3	
Status Indicators	As specified in Section 3	
CRITICAL ADJUSTMENTS		
FREQ ADJUST INPUT	As specified by Section 3	
FREQ ADJUST OUTPUT	As specified by Section 3	
OUTPUT COUPLING	As specified by Section 3	
Adjustment Strap to L1	Affects Q of input resonator	Maintain original position during repair
Coupling Straps	Affects interresonator coupling	See paragraph 5.2.2.3.5 for adjustment procedures
Physical positions of L1, L2, L3, C3, C4	Affect rf characteristics of bandpass filter	Maintain original positions for replacement items
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	

TABLE 4-6. TEST DATA FOR RF CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Simplified Schematic Diagram	Figure 4-5 Figure 4-6	RF circuits Electronic Q control
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-36 Figures 5-33 through 5-35	RF components Electronic Q control circuits
Repair Procedures	Paragraphs 5.3.1.9 through 5.3.1.12 Paragraph 5.3.1.8	Bandpass filter Electronic Q control
Alignment Procedures	Paragraph 5.2.2.3.5	

4.3.5.3.2 Operational Controls

The operational controls consist of five front panel controls that enable the antenna to be tuned in the prescribed sequence and operated in an established manner. The basic control is the TUNE/OPERATE switch that provides overall control of the channel. The input resonator (FREQ ADJUST INPUT) and output resonator (FREQ ADJUST OUTPUT) tuning controls are used for tuning the bandpass filter of the rf section to pass the desired signal and reject all others. The output coupling adjustment (OUTPUT COUPLING) control is used for adjusting the coupling of the bandpass filter to the combiner to establish a low vswr impedance match between the antenna coupler input and the load connected to the output of the combiner. The emergency bypass (EMERGENCY) switch enables the antenna coupler to continue to operate under certain fault conditions.

4.3.5.3.2.1 TUNE/OPERATE Switch A6S1S2

The TUNE/OPERATE switch selects the required circuits to monitor the performance of the channel, to switch the rf signal path at the rf relay assembly, and to protect the transmitter and coupler group during tuning and operation of the antenna coupler. The TUNE/OPERATE switch A6S1 is a five-position rotary switch mounted at the left center of the antenna coupler front panel. It is a three-deck switch having two poles per deck and five positions per pole with a contact rating of 5 amperes at 28 vdc. Decks 1 and 2 are make-before-break, and deck 3 break-before-make. The TUNE/OPERATE switch also contains, as an integral part of the assembly, a pushbutton switch (A6S2) that functions between positions 4 and 5.

The five positions of the TUNE/OPERATE switch are OFF, TUNE-1, TUNE-2, TUNE-3, and OPERATE, with a PUSH TO TURN requirement between TUNE-3 and OPERATE positions. In the OFF position, the TUNE/OPERATE switch deactivates the control circuits and monitoring devices of the antenna coupler. The output resonator is shorted to completely decouple the channel from other channels in the group and the transmitter interlock circuit is opened to prevent rf from being applied to the channel.

In the TUNE-1 position, the TUNE/OPERATE switch selects the circuits required for tuning the input resonator of the bandpass filter in the rf section. The TUNE/OPERATE switch activates the control circuits that (1) close the transmitter interlock circuit, and (2) energize the associated relay pair in the rf relay assembly to switch the transmitter rf power to the power attenuator. The short across the output resonator is maintained so that the input resonator can be tuned for maximum voltage without being loaded by the output resonator. The switch also connects the input resonator voltage sensor A2 to the RF POWER REFLECTED meter for monitoring of the input resonator voltage during tuning.

In the TUNE-2 position, the TUNE/OPERATE switch selects the circuits required for tuning the output resonator of the bandpass filter. The switch maintains the same conditions as in the TUNE-1 position except that it activates control circuits to remove the short from the output resonator. The input resonator voltage is monitored for a minimum value on the RF POWER REFLECTED meter as the output resonator is tuned.

In the TUNE-3 position, the TUNE/OPERATE switch selects the circuits required for loading the antenna coupler by adjusting the output coupling. The switch maintains the same conditions as in the TUNE-2 position, except that it connects the tune reflectometer 1A6A6 to the RF POWER REFLECTED meter (in place of input resonator voltage sensor A2) for monitoring very low levels of reflected power during adjustment of output coupling. After the antenna coupler is properly adjusted, the TUNE/OPERATE switch is depressed (PUSH TO TURN); this activates the pushbutton switch A6S2 which opens the transmitter keyline and removes the transmitter rf from the channel to protect the rf relay contacts when switching from tune to operate conditions. Releasing the TUNE/OPERATE switch restores the rf to the channel.

In the OPERATE position, the TUNE/OPERATE switch selects the circuits required for normal operation of the antenna coupler. The switch activates control circuits that deenergize the associated relays in the rf relay assembly to switch the transmitter rf path directly into the rf section of the antenna coupler. The switch connects the output of the associated operate reflectometer (1A6A2, 1A6A3, 1A6A4 or 1A6A5) to the RF POWER REFLECTED meter so that the reflected power can be monitored during operation.

4.3.5.3.2.2 FREQ ADJUST INPUT Control

The FREQ ADJUST INPUT control is provided for tuning the input resonator of the bandpass filter in the rf section. This control consists of a rotary control knob (mounted on the right side of the front panel) connected by means of a geared drive assembly and driveshaft to the tuning capacitor of the input resonator. Also connected to the geared drive assembly is a horizontally moving, flexible steel tape dial. This frequency indicating tape is calibrated within 2 percent of the resonant frequency of the input resonator in the frequency range over which the antenna coupler operates. The tape is calibrated from 1.9 to 6.4 mc for Antenna Coupler CU-1774/SRA-56, from 3.9 to 12.6 mc for Antenna Coupler CU-1774/SRA-57; and from 9.3 to 32.0 mc for Antenna Coupler CU-1776/SRA-58. Positive stops on the control prevent overdriving the tuning capacitor in either direction. A locking device enables the control to be locked at any desired position.

4.3.5.3.2.3 FREQ ADJUST OUTPUT Control

The FREQ ADJUST OUTPUT control is provided for tuning the output resonator of the bandpass filter in the rf section. This control, also mounted on the right side of the front panel, is identical to the FREQ ADJUST INPUT control.

4.3.5.3.2.4 OUTPUT COUPLING Control

The OUTPUT COUPLING control is provided for adjusting the position of the output link with respect to the inductor of the output resonator, thus controlling the degree of inductive coupling for loading the antenna coupler. The OUTPUT COUPLING control consists of a rotary control knob (mounted on the lower left side of the front panel) connected through a chain-drive assembly to the link-drive screw shaft mounted on the left side of the bandpass filter box. Mounted on the screw shaft is a mating block that contacts and operates the cabinet-mounted slide mechanism within the equipment cabinet to physically move the output link in and out of the antenna coupler. This mechanism also activates the coupling control switch S1 described under the control circuit section (see paragraph 4.3.5.3.4.5). Also connected to the chain drive assembly is a three-digit rotary counter that indicates the relative position of the output link with respect to the output resonator.

4.3.5.3.2.5 EMERGENCY Switch S3

An EMERGENCY switch is provided to enable the antenna coupler to continue to operate under certain fault conditions by bypassing the associated protective circuits. The protective circuits that are bypassed by this switch are the loss-of-air-flow, excessive vswr, and overvoltage (see paragraphs 4.3.5.3.4.6 and 4.3.5.3.4.7). This switch is a two-position toggle switch mounted at the upper left of the front panel. When operated to ON, the EMERGENCY switch removes the fault signal from the control relay circuit (see paragraph 4.3.5.3.4.1) to close the transmitter interlock and permit the antenna coupler to operate in an emergency mode.

4.3.5.3.2.6 Test Data

The procedures for testing the operational control section are limited to visual inspections and electrical continuity checks of the contacts of the TUNE/OPERATE and EMERGENCY switches, and visual inspection and mechanical alignment of the FREQ AJUST INPUT, FREQ ADJUST OUTPUT, and OUTPUT COUPLING controls, drive mechanisms, and indicator devices. See paragraph 5.2.2.3.3 for alignment and paragraph 5.3.1.8 for repair information.

4.3.5.3.3 Monitoring Section

The monitoring section consists of indicating devices and circuits that (1) provide the operator with visual indications required for tuning and operating the antenna coupler properly, and (2) provide the control circuit signals required to ensure that the tuning sequence is performed correctly and that the equipment is protected from the effects of a malfunction. The monitoring section consists of two voltage sensors, two front panel meters, and airflow sensor, and four front panel indicator lamps.

4.3.5.3.3.1 Voltage Sensors A2 and A3

These two voltage sensors are identical in circuitry but perform different functions. Voltage sensor A2 samples the input resonator rf voltage and produces a dc signal which is fed to the RF POWER REFLECTED meter during tuning of the input, and initial tuning of the output, resonators. Voltage sensor A3 samples the output resonator rf voltage and produces a dc signal which is fed to the overvoltage control circuit in the control circuit section (see paragraph 4.3.5.3.4.7). This circuit operates protective devices to shut down the transmitter and antenna coupler if the output resonator voltage rises to an excessive value.

A simplified schematic diagram of the voltage sensor is shown in figure 4-7. The resonator rf voltage is sampled by a capacitive probe that extends into the resonator compartment. This sampled rf is rectified by diode CR1 and filtered by the RC network formed by resistors R1, R2, and capacitor C2. The dc output signal is developed across resistor R2 which is variable to permit the voltage sensor dc output to be adjusted. During the control system calibration (paragraph 5.2.1.5.4), resistor R2 of voltage sensor A2 is adjusted to obtain 150 watts on RF POWER REFLECTED meter when the voltage between E4 and E1 is 0.48 vdc (CU-1772/SRA-56), 0.12 vdc (CU-1774/SRA-57, or 0.07 vdc (CU-1776/SRA-58). Resistor R2 of voltage sensor A3 is adjusted to shut down the antenna coupler when the voltage between E4 and E1 is 42.8 vdc (CU-1772/SRA-56), 26.8 vdc (CU-1774/SRA-57) or 32.1 vdc (CU-1776/SRA-58). All voltage sensors within all antenna couplers in all coupler groups are completely interchangeable provided that they are properly adjusted during the control system calibration procedures.

4.3.5.3.3.2 RF POWER Meters M1 and M2

Two meters, RF POWER FORWARD and RF POWER REFLECTED, on the front panel are used by the operator in tuning and operating the antenna coupler. The RF POWER FORWARD meter M1 continuously displays the forward rf component of the transmitter power into the channel as sampled by the operate reflectometers, 1A6A2, 1A6A3, 1A6A4, or 1A6A5. Depending upon the position of the TUNE/OPERATE switch, the RF POWER REFLECTED meter M2 displays (1) the input resonator voltage as sampled by voltage sensor A2, (2) the low-level reflected rf power of the input of the antenna coupler as sampled by the tune reflectometer 1A6A6, or (3) the high-level reflected rf power at the input to the channel as sampled by the associated operate reflectometer.

The rf power meter circuits are shown in the simplified schematic diagram in figure 4-8. Both meters M1 and M2 are 0-100 microammeters with a resistance of 1250±125 ohms and an accuracy of 2 percent of full scale reading. RF POWER FORWARD meter M1 is scaled to indicate 0 to 1.5 kw; RF POWER REFLECTED meter M2 is scaled to indicate 0 to 250 watts.

As shown in figure 4-8, the RF POWER FORWARD meter M1 is connected continuously across the output terminals of the forward rf power section of the operate reflectometer through pins A and B of receptacle J1. When the TUNE/OPERATE switch A6S1 is in TUNE-1 or TUNE-2 positions, the RF POWER REFLECTED meter M2 is connected across the output terminals of input resonator voltage sensor A2 to monitor the input resonator rf voltage. When the TUNE/OPERATE switch is in the TUNE-3 position, meter M2 is connected across the output terminals of the tune reflectometer 1A6A6 through pins D and E of antenna coupler receptacle J1. When the TUNE/OPERATE switch is in OPERATE, meter M2 is connected across the output terminals of the reflected rf power section of the operate reflectometer through pins C and B of receptacle J1 and through resistor A1R24 on circuit control board A1. Resistor A1R24 is a precision calibration resistor that is a functional part of the operate reflectometer circuit (see paragraph 4.3.1). This circuit also provides continuously a monitoring circuit through a parallel connection for the excessive reflected power control circuit in the control circuit section (see paragraph 4.3.5.3.4.7).

4.3.5.3.3.3 Air Flow Sensor Switch S2 and Indicator Circuit

When ac is applied to the coupler group, the ac distribution circuits provide 115 vac to operate the fans in all antenna couplers. The air flow generated by the fans is monitored by an air flow sensor located on the bottom of the bandpass filter box. When the air flow becomes inadequate, the sensor switch closes to activate loss-of-air-flow protective circuits within the antenna coupler (see paragraph 4.3.5.3.4.6).

A simplified schematic of the air flow sensor and indicator circuit is shown in figure 4-10. When TUNE/OPERATE switch is in any position but OFF, +35 vdc is applied to the NC contact of air flow sensor switch S2. Switch S2 is a vane operated switch located in the air stream of the fan. When the air stream is adequate, switch S2 closes to the NO contact and applies dc common to the air flow indicator circuit. When the air stream becomes inadequate, switch S2 closes to the NC contact and +35 volts is applied through pin 10 on circuit control board A1, the loss-of-air-flow protective circuit in the control circuit section, current limiting resistor 1AR5, and pin 16 on the control board, to light AIR FLOW indicator lamp DS3. The loss-of-air-flow protective circuit contains a 7-second delay before shutting down the antenna coupler to allow the fan to come up to full speed when initially energized. The delay circuit is automatically reset when the air flow vane switch operates to eliminate the effects of turbulance in the air stream.

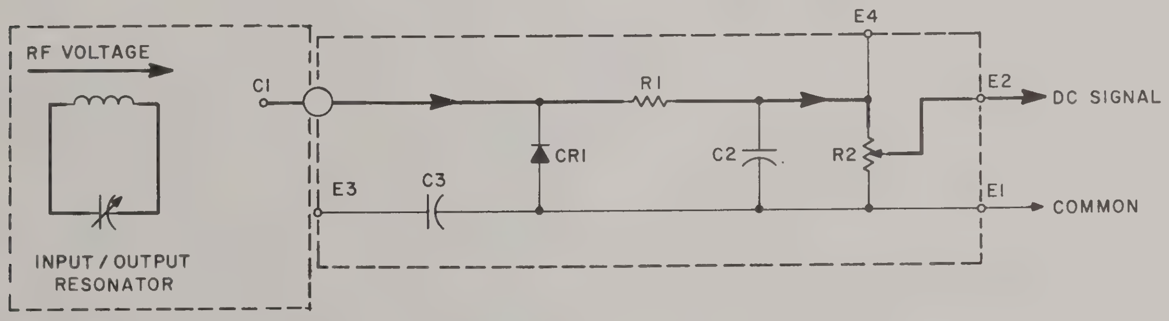
The loss-of-air-flow circuit also sends a fault signal to the control relay circuit (paragraph 4.3.5.3.4.1) via the emergency bypass switch to shut down the antenna coupler and a signal to the ALARM circuit in the power supply panel to activate the audible ALARM. (See paragraph 4.3.5.3.4.6 for a more detailed explanation of these circuits.)

4.3.5.3.3.4 Status Indicators

Three indicator lamps are provided on the front panel to indicate the operational status of the antenna coupler: NORMAL, RETUNE, and EMERGENCY. The NORMAL and RETUNE indicators function together to indicate if the antenna coupler is functioning properly or if a malfunction or maladjustment has caused the protective control circuits to operate. The EMERGENCY indicator lamp lights to show that the antenna coupler is being operated in an emergency mode.

Simplified schematic diagrams of the status indicator circuits are shown in figure 4-10. In the NORMAL/RETUNE indicator circuits, +35 volts dc is applied to the contacts of protective control relay A1K1 on the circuit control board and to one side of the NORMAL indicator DS1 through the TUNE/OPERATE switch in all positions but OFF. When the operation of the antenna coupler is NORMAL, relay A1K1 is energized, and the +35 vdc lights the NORMAL indicator DS1 through resistor R1 to ground. When relay A1K1 deenergizes, + 35 vdc is applied to both sides of lamps DS1 and the NORMAL indicator goes out since both sides of the lamp are at the same potential. The +35 vdc causes current to flow through resistor A1R3 to light the RETUNE indicator DS4.

The EMERGENCY indicator DS2 lights when EMERGENCY switch S3 is in the ON position by creating a path for the +35 vdc to ground through DS2, switch half S3B and resistor A1R4. The other half of EMERGENCY switch S3A bypasses the loss-of-air-flow excessive vswr and overvoltage protective circuits (see paragraph 4.3.5.3.4.1) for emergency operation.



80119-063

Figure 4-7. Voltage Sensor, Simplified Schematic Diagram

4.3.5.3.3.5 Test Data

The procedures for isolating a fault to the monitoring circuits consist of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters, status indicators, and fans and AIR FLOW indicator during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit and component consists of continuity checks and testing of individual circuits. Test information concerning the monitoring circuits is presented in table 4-7.

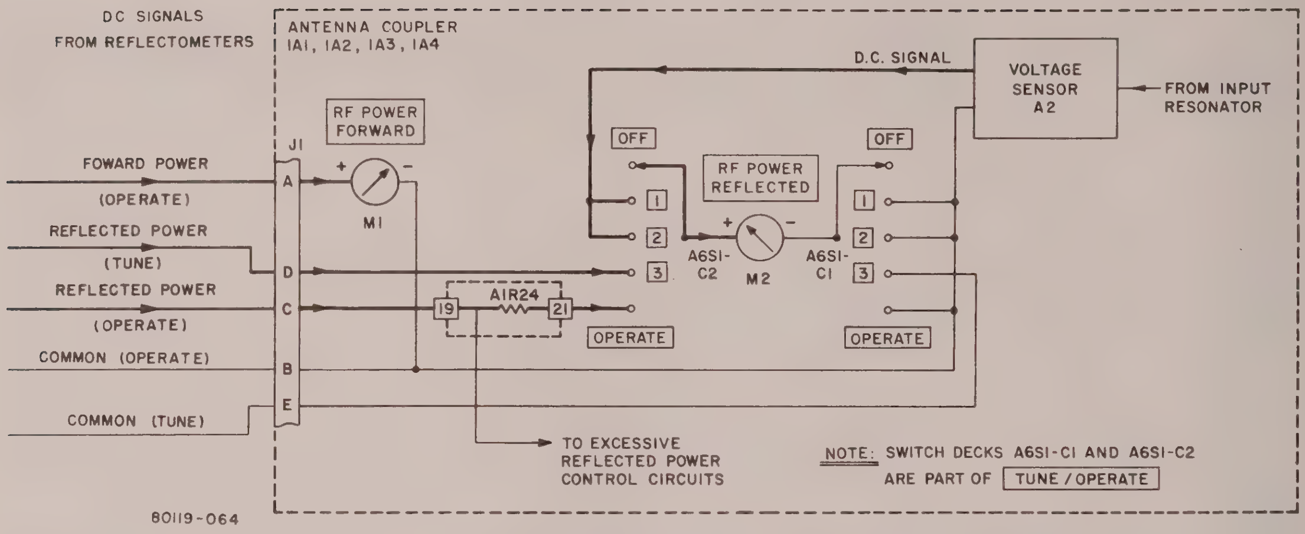

DC SIGNALS FROM REFLECTOMETERS
ANTENNA COUPLER 1A1, 1A2, 1A3, 1A4
D.C. SIGNAL
VOLTAGE SENSOR A2
FROM INPUT RESONATOR
RF POWER FORWARD
J1
FOWARD POWER (OPERATE)
REFLECTED POWER (TUNE)
REFLECTED POWER (OPERATE)
COMMON (OPERATE)
COMMON (TUNE)
A
D
C
B
E
M1
OFF
OFF
RF POWER REFLECTED
1
2
3
1
2
3
A6S1-C2
M2
A6S1-C1
A1R24
19
21
OPERATE
OPERATE
TO EXCESSIVE REFLECTED POWER CONTROL CIRCUITS
NOTE: SWITCH DECKS A6S1-C1 AND A6S1-C2 ARE PART OF TUNE/OPERATE
80119-064

Figure 4-8 RF Power Meters, Simplified Schematic Diagram

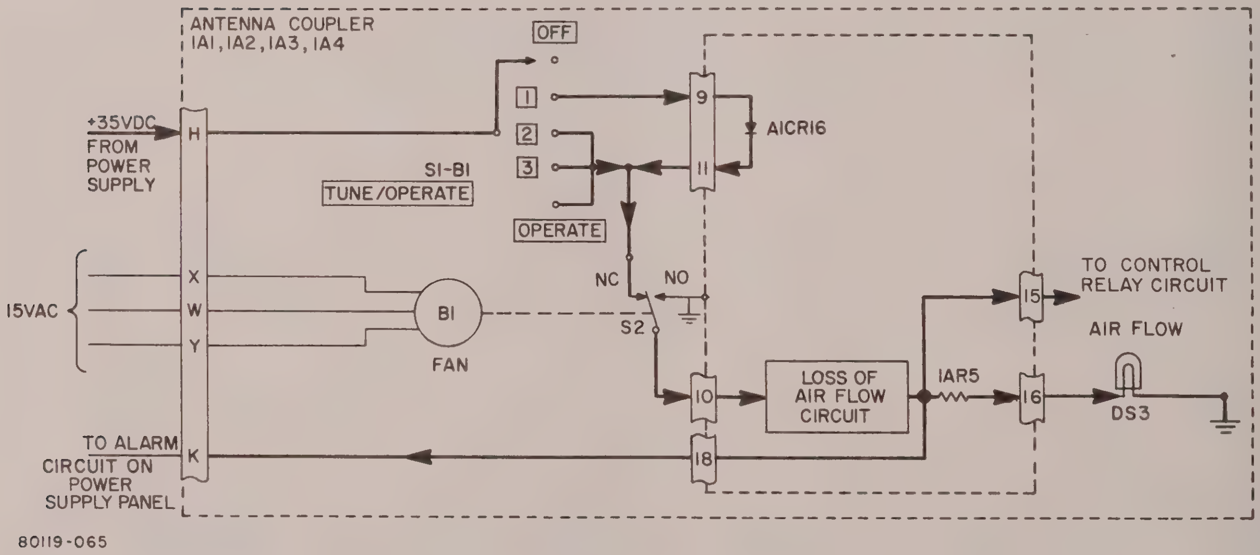
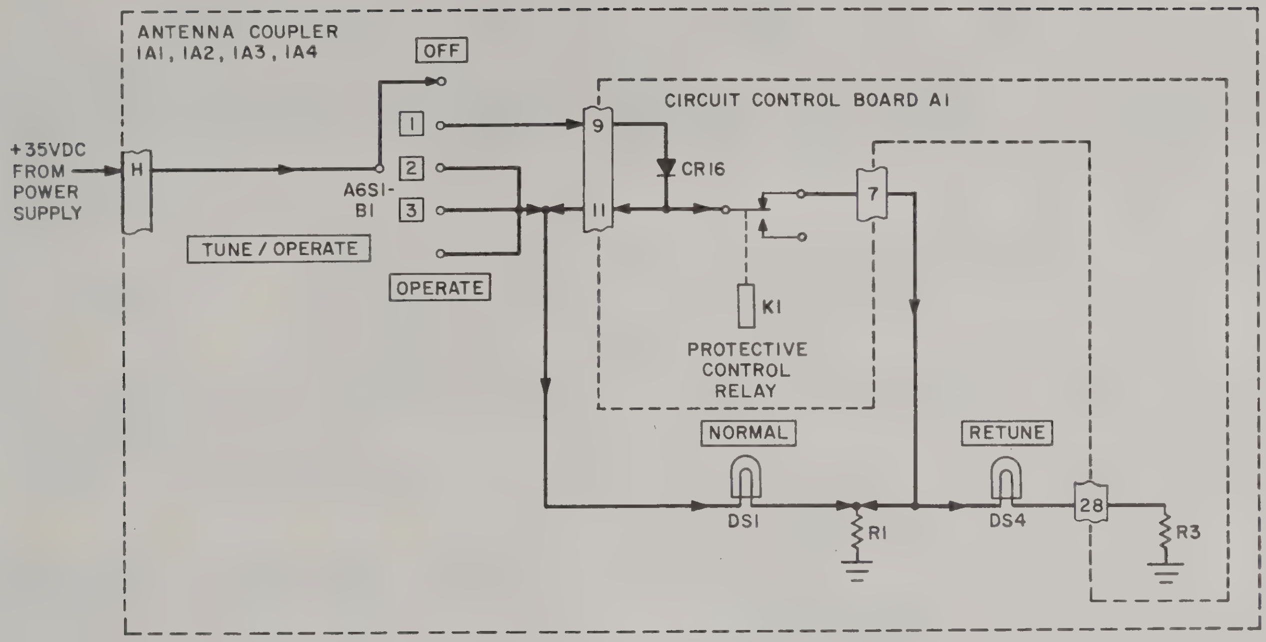

ANTENNA COUPLER 1A1, 1A2, 1A3, 1A4
+35VDC FROM POWER SUPPLY
H
OFF
1
2
3
OPERATE
S1-B1
TUNE/OPERATE
9
11
A1CR16
15VAC
X
W
Y
B1
FAN
NC
NO
S2
TO CONTROL RELAY CIRCUIT
15
AIR FLOW
LOSS OF AIR FLOW CIRCUIT
10
1AR5
16
DS3
TO ALARM CIRCUIT ON POWER SUPPLY PANEL
K
18
80119-065

Figure 4-9. Air Flow Sensor and Indicator, Simplified Schematic Diagram

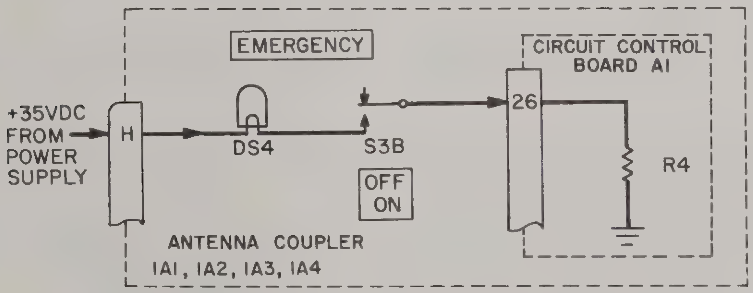
4.3.5.3.4 Control Section

The control section in the antenna coupler provides the method of enforcing sequential tuning and protecting the equipment from damage due to a maladjustment or malfunction of the antenna coupler, coupler group, antenna or transmitter. The control section consists of eight control and protective circuits: control relay, automatic reset, automatic decoupling, coupling control, rf relay control and inhibit, loss-of-air-flow, excessive vswr, and overvoltage circuits.

The control relay circuit provides the means to shut down the antenna coupler and associated transmitter if the operating conditions established by other control circuits are not satisfied.


ANTENNA COUPLER
1A1, 1A2, 1A3, 1A4
OFF
CIRCUIT CONTROL BOARD A1
+35VDC FROM POWER SUPPLY
H
1
2
3
A6S1-B1
TUNE / OPERATE
OPERATE
9
11
CR16
7
K1
PROTECTIVE CONTROL RELAY
NORMAL
RETUNE
DS1
R1
DS4
28
R3

NORMAL/RETUNE INDICATOR


EMERGENCY
CIRCUIT CONTROL BOARD A1
+35VDC FROM POWER SUPPLY
H
DS4
S3B
OFF
ON
26
R4
ANTENNA COUPLER
1A1, 1A2, 1A3, 1A4

80119-066

EMERGENCY INDICATOR

Figure 4-10. Status Indicators, Simplified Schematic Diagram

TABLE 4-7. TEST DATA FOR MONITORING CIRCUITS

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Voltage Sensors A2, A3 Input to output voltage relationship	3.0 v rms rf input yields 4.2 vdc output (E4/E1)	input at voltage sensor probe; output depends upon meter impedance
Voltage Sensor A2 Calibration Voltages	0.48 vdc across R1 (E4/E1)	CU-1772/SRA-56
	0.12 vdc across R1 (E4/E1)	CU-1774/SRA-57
	0.17 vdc across R1 (E4/E1)	CU-1776/SRA-58

TABLE 4-7. TEST DATA FOR MONITORING CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS (Continued)		
Voltage Sensor A3		
Calibration Voltages	42.8 vdc across R1 (E4/E1)	CU-1772/SRA-56
	26.8 vdc across R1 (E4/E1)	CU-1774/SRA-57
	32.1 vdc across R1 (E4/E1)	CU-1776/SRA-58
Air Flow Delay Circuit	7 seconds, nominal	
TEST POINTS		
E - J1-A/B	Calibration of RF POWER FORWARD meter	Connect + lead to J1-A
F - J1-C/B	Calibration of RF POWER REFLECTED meter	Connect + lead to J1-C
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
N - A2-E2/E1, A3-E2/E1	Adjustment of A2R2, A3R2	Connect + lead to E2
P - A2-E4/E1, A3-E4/E1	Adjustment of A2R2, A3R2	Connect + lead to E4
TEST EQUIPMENT		
Power Supply	35 vdc, 0.4 amperes	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraphs 5.2.1.5.1 and 5.2.1.5.4 for checks and calibration procedures
Multimeter	AN/PSM-4D	Used for continuity checks and component testing for all monitoring circuits
PERFORMANCE INDICATORS		
Voltage Sensor A2		
RF POWER REFLECTED	As specified in Section 3 (Operator's Handbook)	Meter indicates only when TUNE/OPERATE switch is in TUNE-1 and TUNE-2 positions
Voltage Sensor A3		
Transmitter	Trips off when output resonator exceeds critical voltage	Voltage sensor A3 drives overvoltage protective circuit (see paragraph 4.3.5.3.4.7)

TABLE 4-7. TEST DATA FOR MONITORING CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS (Continued)		
Air Flow Sensor and Indicator		
AIR FLOW	Out	
ALARM	Silent	
Fan	Operates	
CRITICAL ADJUSTMENTS		
Voltage Sensor A2	A2R2	Calibrates RF POWER REFLECTED meter used in tuning input and output resonators
Voltage Sensor A3	A3R2	Sets trip level for overvoltage protective circuit
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-7 Figure 4-8 Figure 4-9 Figure 4-10	Voltage sensors RF power meters Air flow sensor and indicators Status indicators
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-5 Figure 5-6 Figure 5-30	Monitoring devices Voltage sensor RF power meters and status indicators
Repair Procedures	Paragraph 5.3.1.17	
Calibration Procedures	Paragraph 5.2.1.5.4	

If the primary power (115 vac) is removed from the coupler group, the automatic reset circuit resets the control relay circuit to its original condition as the primary power is restored. The automatic decoupling circuit places a short across the output resonator to completely decouple the antenna coupler (channel) from the coupler group when the antenna coupler is off,during certain tuning steps, or when a malfunction of the equipment occurs. The coupling control circuit ensures that the output resonator is properly decoupled or coupled as required during the tuning or operating procedures. The rf relay control and inhibit circuits energize and deenergize the appropriate relay pair in the rf relay assembly during tuning and operation, and establish priority of access to the power attenuator and tune reflectometer between the four antenna couplers within a cabinet. The loss-of-air-flow circuit shuts down the affected antenna coupler and associated transmitter to protect the equipment from damage that might be caused by a rise in temperature within the antenna coupler. The excessive vswr circuit protects the antenna coupler and transmitter from damage due to excessive reflected power caused by a malfunction of the equipment. The overvoltage circuit protects the antenna coupler from damage caused by an excessive rise in the output resonator voltage level during tuning or operation of the antenna coupler.

Most of the components of the control circuits are located on the printed circuit control board A1. Each antenna coupler contains one circuit control board, and all circuit control boards in all antenna couplers within all three coupler groups are identical in function and circuitry. These printed circuit boards are completely interchangeable between antenna couplers or coupler groups, provided that excessive vswr calibration resistor A1R21 is properly adjusted.

4.3.5.3.4.1 Control Relay Circuit

4.3.5.3.4.1.1 Functional Description

The fundamental circuit in the control section is the control relay circuit shown in simplified schematic diagram in figure 4-11. This circuit provides the overall antenna coupler control by the energized/deenergized state of control relay A1K1. Relay A1K1 is energized when the tuning and operation of the antenna coupler is acceptable. When improper tuning or operation procedures are followed or a malfunction occurs within the equipment, relay A1K1 deenergizes and shuts down the antenna coupler. The circuit operates in the following manner.

Plus 35 volts from the power supply is applied to pin H of receptacle J1 on the antenna coupler and fed to TUNE/OPERATE switch deck S1B1. When the TUNE/OPERATE switch is in TUNE-1 position, the +35 vdc is routed through pin 9 on the circuit control board directly to the coil of relay A1K1, and the path to ground is through zener diode VR2 and resistor R2. This causes relay A1K1 to energize closing transmitter interlock contacts B2-B1 and circuit control contacts A2-A1. When contacts A2-A1 close, +35 vdc is applied through diodes CR16 and CR17 to the coil of relay A1K1 and the relay is latched in the energized state. When the TUNE/OPERATE switch is switched to TUNE-2, TUNE-3, or OPERATE position, the +35 vdc is applied to relay A1K1 through pin 11 of the circuit control board, closed contacts A2-A1, and diode CR17 to maintain the relay in the energized condition.

If dc power to antenna coupler should fail due to a loss of primary ac power, relay A1K1 will deenergize. When power is restored, an automatic reset circuit enables relay A1K1 to be reenergized at any position of the TUNE/OPERATE switch without retuning the antenna coupler from the beginning.

Under normal operation, relay A1K1 remains energized and +35 vdc is available through closed contacts A2-A1 and pin 6 of the circuit control board to operate the rf relay control and inhibit circuit, and the automatic decoupling switch circuit. However, relay A1K1 will deenergize if (1) the output coupling is not adjusted properly, (2) an attempt is made to tune the antenna coupler while another coupler is being tuned, or (3) a malfunction occurs that results in a loss-of-air-flow, excessive output resonator voltage, or excessive reflected power. The circuits that control these functions apply a +35 vdc to back bias zener diode VR2, removing the ground return for the relay and eliminating the potential difference across the relay coil necessary to maintain the relay in an energized state.

When this occurs, relay contacts B2-B1 open the transmitter interlock and shut down the transmitter, and relay contacts A2-A1 open to shut down the antenna coupler. This removes the +35 vdc from the rf relay control and inhibit circuit, and the solenoid of the automatic decoupling circuit. Plus 35 vdc is then applied through contacts A2-A1 and pin 7 on the circuit control board to light the RETUNE indicator (see paragraph 4.3.5.3.3.4).

When the EMERGENCY switch S3 is operated to ON, the loss-of-air-flow, excessive vswr and overvoltage protective circuits are bypassed to permit the antenna coupler to operate in an emergency mode. Operating the EMERGENCY switch to ON removes any fault control signal produced by these protective circuits from the anode of zener diode VR2. However, the coupling control and inhibit control signals cannot be bypassed, and the antenna coupler will shut down if the coupling is not properly adjusted or if an attempt is made to tune the antenna coupler while another antenna coupler is in the tune mode.

The transmitter interlock circuit shown in figure 4-11 also has the drawer interlock connected in series. This prevents the transmitter from operating through an antenna coupler unless it is secured in position within the equipment cabinet. The transmitter key line also shown in the figure is controlled by the operation of TUNE/OPERATE switch A6S1S2. When the switch A6S1S2 is depressed between TUNE-3 and OPERATE positions, the circuit is opened and causes the transmitter to interrupt, removing rf from the channel during the transfer. This circuit is described in more detail under the operational controls (see paragraph 4.3.5.3.2.1).

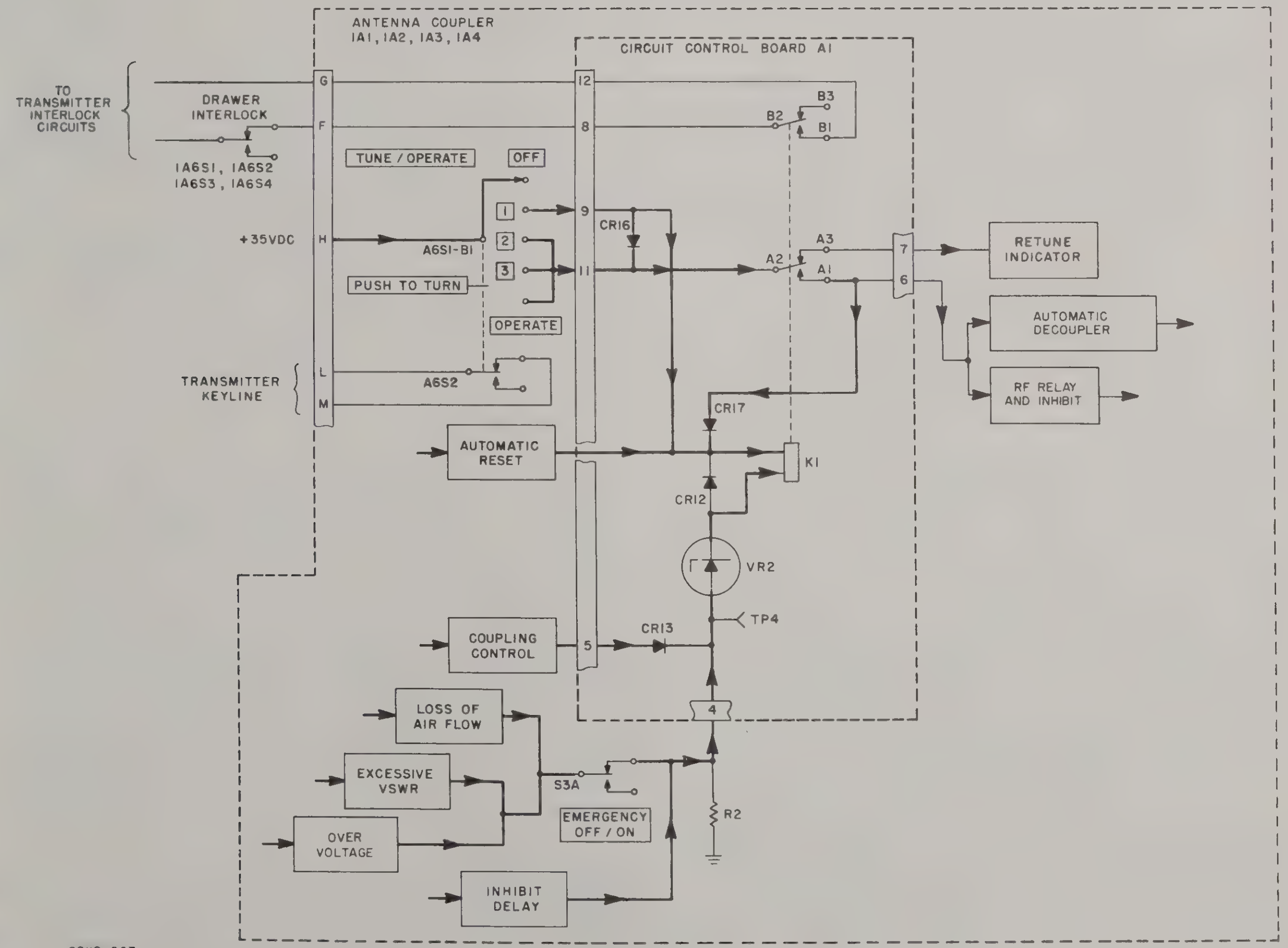

ANTENNA COUPLER
1A1, 1A2, 1A3, 1A4
CIRCUIT CONTROL BOARD A1
TO TRANSMITTER INTERLOCK CIRCUITS
DRAWER INTERLOCK
1A6S1, 1A6S2
1A6S3, 1A6S4
G
F
H
L
M
12
8
9
11
5
4
7
6
B3
B2
B1
TUNE / OPERATE
OFF
1
2
3
+35VDC
A6S1-B1
PUSH TO TURN
OPERATE
TRANSMITTER KEYLINE
A6S2
CR16
A3
A2
A1
RETUNE INDICATOR
AUTOMATIC DECOUPLER
RF RELAY AND INHIBIT
CR17
AUTOMATIC RESET
K1
CR12
VR2
TP4
CR13
COUPLING CONTROL
LOSS OF AIR FLOW
EXCESSIVE VSWR
OVER VOLTAGE
S3A
EMERGENCY OFF / ON
R2
INHIBIT DELAY
80119-067

Figure 4-11. Control Relay, Simplified Schematic Diagram

4.3.5.3.4.1.2 Test Data

The procedure for isolating a fault to the control relay circuit consists of a logical choice based on observations of the status indicators, and transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component of the circuit consists of continuity checks and testing of individual components. Test information concerning the control relay circuit is presented in table 4-8.

TABLE 4-8. TEST DATA FOR CONTROL RELAY CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Control Relay A1K1 Energizing voltage Coil resistance	 28.8 vdc 640 ohms	
A1TP4	+4 vdc (approximately) + 35 vdc	Quiescent state Deenergizes A1K1
TEST POINTS		
G - J1-G/F	Transmitter interlock	Short circuit during normal operation
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
J - J1-L/M	Transmitter keyline	Short circuit during normal operation, opened when TUNE/OPERATE switch is depressed
T - A1TP4	Monitors and checks operation of control relay	Connect + lead to A1TP4, - lead to chassis ground
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraph 5.2.1.5.4.3 for procedures to check control relay operation
Multimeter	AN/PSM-4D	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
Status Indications	As specified in Section 3 (Operator's Handbook)	
Transmitter	As specified in Section 3	

TABLE 4-8. TEST DATA FOR CONTROL RELAY CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-11	
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-45	
Repair Procedures	Paragraphs 5.3.1.7 and 5.3.1.17	
Fault Isolation Procedures	Paragraphs 5.2.1.5.1 and 5.2.1.5.4	

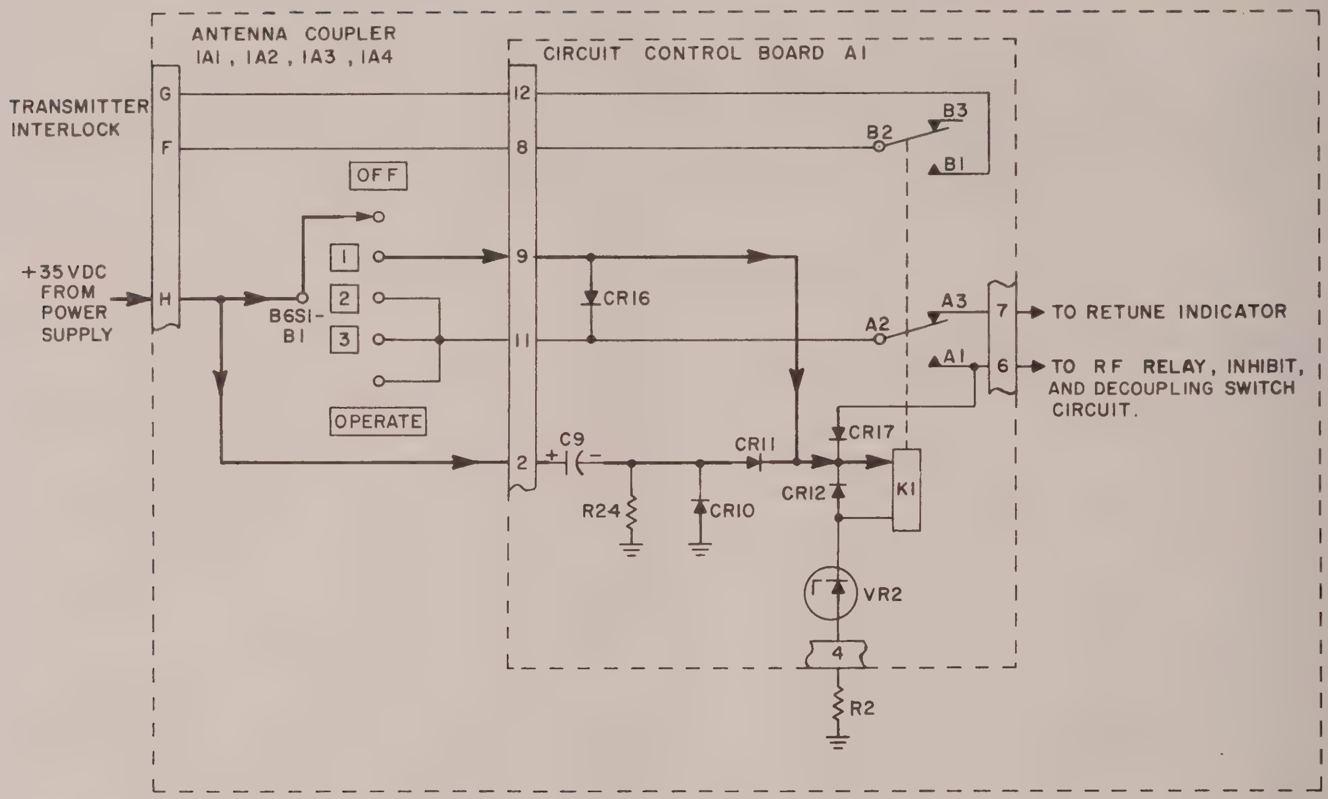
4.3.5.3.4.2 Automatic Reset Circuit

4.3.5.3.4.2.1 Functional Description

If dc power is removed from control relay A1K1 by a failure of the primary ac power, the relay will deenergize. When power is restored to the antenna coupler, relay A1K1 will energize if the TUNE/OPERATE switch is in TUNE-1. To enable the relay to reenergize in other positions of the TUNE/OPERATE switch, an automatic reset circuit is provided. A simplified schematic diagram of the automatic reset circuit is shown in figure 4-12.

As +35 vdc is reapplied to the antenna coupler through pin H of receptacle J1, it is fed to the automatic reset circuit through pin 2 of the circuit control board A1 to capacitor A1C9. Capacitor A1C9 begins to charge through the lowest impedance path consisting of the coil of relay A1K1, and momentarily closes contacts A2-A1. If +35 vdc is also present at relay contact A2, relay A1K1 will latch in the energized condition. However, if +35 vdc is not available at contact A2, the relay will not latch and, since the current decreases as capacitor A1C9 becomes fully charged, relay A1K1 will deenergize and the contacts will open.

Because of the configuration of the control relay circuit, any of the fault conditions that present +35 vdc at the base of zener diode A1VR2 will prevent relay A1K1 from energizing, and the automatic reset circuit will not energize the relay since no difference of potential will exist across the coils of the relay.


ANTENNA COUPLER
1A1, 1A2, 1A3, 1A4
CIRCUIT CONTROL BOARD A1
TRANSMITTER INTERLOCK
G
F
H
12
8
9
11
2
B3
B2
B1
OFF
1
2
3
OPERATE
+35 VDC FROM POWER SUPPLY
B6S1-B1
CR16
A3
A2
A1
7
6
TO RETUNE INDICATOR
TO RF RELAY, INHIBIT, AND DECOUPLING SWITCH CIRCUIT.
CR17
C9
CR11
CR12
K1
R24
CR10
VR2
4
R2

80119-054

Figure 4-12. Automatic Reset Circuit, Simplified Schematic Diagram

4.3.5.3.4.2.2 Test Data

The procedure for isolating a fault to the automatic reset circuit consists of a logical choice based on observations of the status indicators when power is restored to the antenna coupler after a power interrupt or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component within the circuit consists of continuity checks and testing of individual components. Test information concerning the automatic reset circuit is presented in table 4-9.

TABLE 4-9. TEST DATA FOR AUTOMATIC RESET CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
T - A1TP4	Control relay operation	Connect + lead to TP4, - lead to ground
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available

TABLE 4-9. TEST DATA FOR AUTOMATIC RESET CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
TEST EQUIPMENT (Continued)		
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraph 5.2.1.5.1.2 for procedures to check reset circuit
Multimeter	AN/PSM-4D	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
Status Indicator	NORMAL or RETUNE	When power is restored, status indicator must be as before power was disrupted.
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-12	
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figures 5-43, 5-44, 5-45	Control circuit board components
Repair Procedures	Paragraph 5.3.1.17	
Fault Isolation Procedures	Paragraph 5.2.1.5.1.2	

4.3.5.3.4.3 Automatic Decoupling Circuit

4.3.5.3.4.3.1 Functional Description

The automatic decoupling circuit provides a means of completely decoupling the rf section of the antenna coupler from the coupler group as required when the antenna coupler is off,in tuning the input resonator (when the TUNE/OPERATE switch is in TUNE-1), and at any time a fault condition exists as defined by relay A1K1 in the deenergized state. The automatic decoupling circuit is controlled by a solenoid operated shorting switch A5 that places a short across the tuning capacitor plates of the output resonator. A simplified schematic diagram of the automatic decoupling circuit is shown in Figure 4-13.

This figure shows that +35 vdc is applied to TUNE/OPERATE switch deck A6S1-A1 from pin H of antenna coupler receptacle J1 through switch deck A6S1-B1, pin 9 or 11 on circuit control board A1, closed contacts A2-A1 on circuit control relay A1K1, and pin 6 on the circuit control board. When the TUNE/OPERATE switch is in the OFF or TUNE-1 position, +35 vdc cannot be applied to the solenoid A5K1 that operates the shorting switch. When the TUNE/OPERATE switch is in the TUNE-2 or TUNE-3 positions, the +35 vdc path to the solenoid is completed through pin 27, diode A1CR7, and pin 29 of the circuit control board. When the TUNE/OPERATE switch is in the OPERATE position, +35 vdc is applied directly to the solenoid from A1K1.

Thus, solenoid A5K1 energizes only in the TUNE-2, TUNE-3, and OPERATE positions of the TUNE/OPERATE switch provided that circuit control relay A1K1 is energized. When solenoid A5K1 of the switch energizes, the short is removed from the tuning capacitor plates of the output resonator. If circuit control relay A1K1 deenergizes because of a malfunction or maladjustment of the equipment, relay contacts A2-A1 open to remove +35 vdc from the solenoid A5K1. The solenoid deenergizes and the switch operates to place a short across the output resonator.

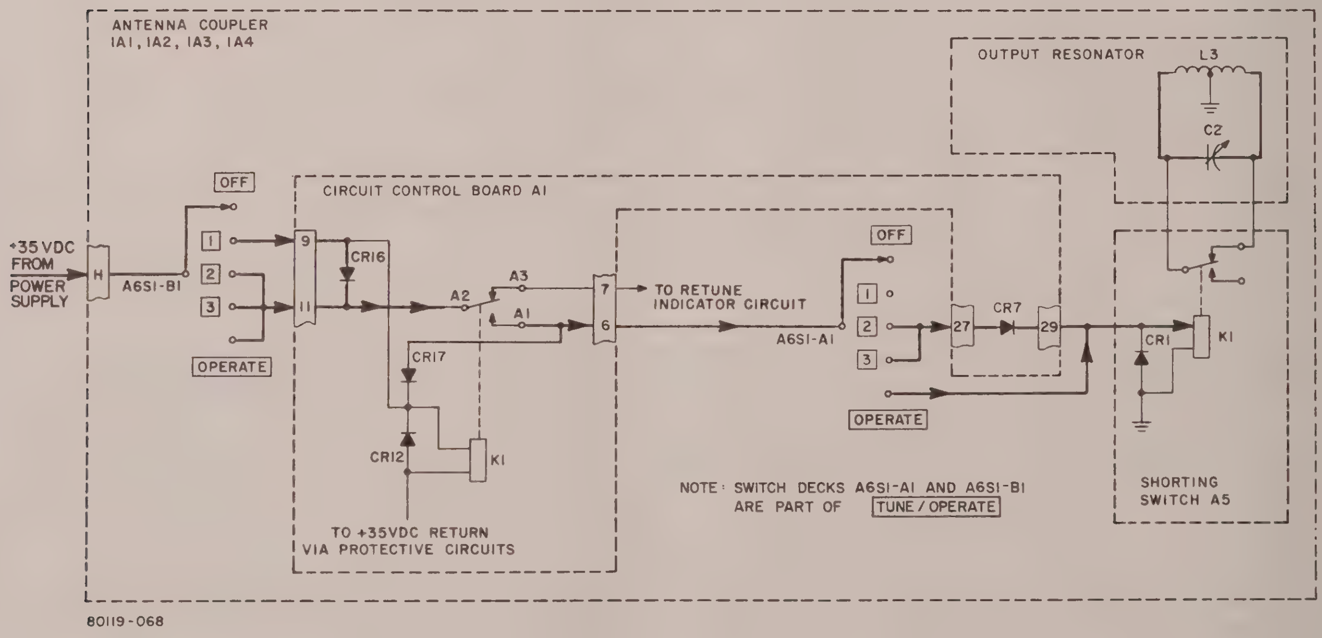

ANTENNA COUPLER
1A1, 1A2, 1A3, 1A4
OUTPUT RESONATOR
L3
C2
+35 VDC FROM POWER SUPPLY
H
A6S1-B1
OFF
1
2
3
OPERATE
CIRCUIT CONTROL BOARD A1
9
11
CR16
A2
A3
A1
7
6
CR17
CR12
K1
TO +35VDC RETURN VIA PROTECTIVE CIRCUITS
TO RETUNE INDICATOR CIRCUIT
A6S1-A1
OFF
1
2
3
OPERATE
27
CR7
29
CR1
K1
SHORTING SWITCH A5
NOTE: SWITCH DECKS A6S1-A1 AND A6S1-B1 ARE PART OF TUNE/OPERATE
80119-068

Figure 4-13. Automatic Decoupling Circuit, Simplified Schematic Diagram

4.3.5.3.4.3.2 Test Data

The procedure for isolating a fault to the automatic decoupling circuit consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters and status indicators during normal tuning and operating procedures, or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component consists of continuity checks and testing of individual components. Test information concerning the automatic decoupling circuit is presented in table 4-10.

TABLE 4-10. TEST DATA FOR AUTOMATIC DECOUPLING CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Shorting Switch A5 Coil resistance	0.35 ohm	
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
TEST EQUIPMENT		
Power Supply	+35 vdc	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraph 5.2.1.5.4.3 for procedures to check the automatic coupling circuit
Multimeter	AN/PSM-4D	Use for continuity checks and component testing
PERFORMANCE INDICATORS		
RF POWER FORWARD	As specified in Section 3 (Operator's Handbook)	
RF POWER REFLECTED	As specified in Section 3	
Status Indicator	NORMAL	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-13	
Detailed Schematic Diagram	Figure 5-51	

TABLE 4-10. TEST DATA FOR AUTOMATIC DECOUPLING CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Parts Location	Figure 5-5 Figure 5-30 Figure 5-45	Shorting switch A5 TUNE/OPERATE switch Circuit control board
Repair Procedures	Paragraphs 5.3.1.7 and 5.3.1.17	
Fault Isolation Procedures	Paragraph 5.2.1.5.4.3	

4.3.5.3.4.4 RF Relay Control and Inhibit Circuit

4.3.5.3.4.4.1 Functional Description

The rf relay control and inhibit circuit enables the transmitter rf signal to be switched by the rf relay to the power attenuator and tune reflectometer during tuning of the antenna coupler. To switch the rf relay, the antenna coupler must provide a +35 vdc signal to the associated pair in the rf relay assembly (see paragraph 4.3.2). However, only one antenna coupler at a time can be permitted access to the power attenuator and tune reflectometer. Therefore an inhibit circuit is included to prevent operation of the rf relay circuit if another antenna coupler is being tuned. A simplified schematic diagram of the rf relay and inhibit circuit is shown in figure 4-14.

Plus 35 vdc from the power supply appears at TUNE/OPERATE switch deck A6S1-A1 through pin 6, circuit control relay A1K1 closed contacts A2-A1, and pins 9 or 11 of the circuit control board A1; switch deck A6S1-B1; and pin H of antenna coupler receptacle J1. TUNE/OPERATE switch deck A6S1-A1 applies +35 vdc to the rf relay through pin N of receptacle J1 directly when the TUNE/OPERATE switch is in TUNE-1, and through pin 27, diode CR6, and pin 30 on the circuit control board when the TUNE/OPERATE switch is in TUNE-2 or TUNE-3 positions. When the TUNE/OPERATE switch is in the OFF and OPERATE positions, +35 vdc is prevented from operating the rf relay or producing an inhibit output to the other antenna couplers.

Plus 35 volts also appears at the anodes of diodes CR1, CR2, and CR3 to form the inhibit circuitry. The +35 vdc is applied to the inhibit delay circuit in the other three antenna couplers in the coupler group through pins 34, 32, and 31 on circuit control board A1, and pins P, R, and S, respectively, on antenna coupler receptacle J1. This voltage appears at pin J of receptacle J1 in the other antenna couplers.

If another antenna coupler is being tuned, the inhibit circuit of that antenna coupler will present, at pin J of receptacle J1, +35 vdc input to the inhibit delay circuit. This voltage is connected to the collector of emitter follower transistor A1Q4 through pin 1 on the circuit control board. Conduction of transistor A1Q4 is controlled by the voltage across capacitor A1C11 which increases as A1C11 changes toward +35 vdc through resistor A1R23. The voltage across resistor R26 increases toward +35 volts as transistor A1Q4 reaches full conduction. This voltage is applied to the anode of zener diode A1VR2 through switch deck A6S1-A2 and pin 4 of the circuit control board when the TUNE/OPERATE switch is in the TUNE-1, TUNE-2 or TUNE-3 position. Circuit control relay A1K1 deenergizes, shuts down the antenna coupler, and removes the +35 vdc from switch deck A6S1-A1, thus preventing the rf relay pair from energizing.

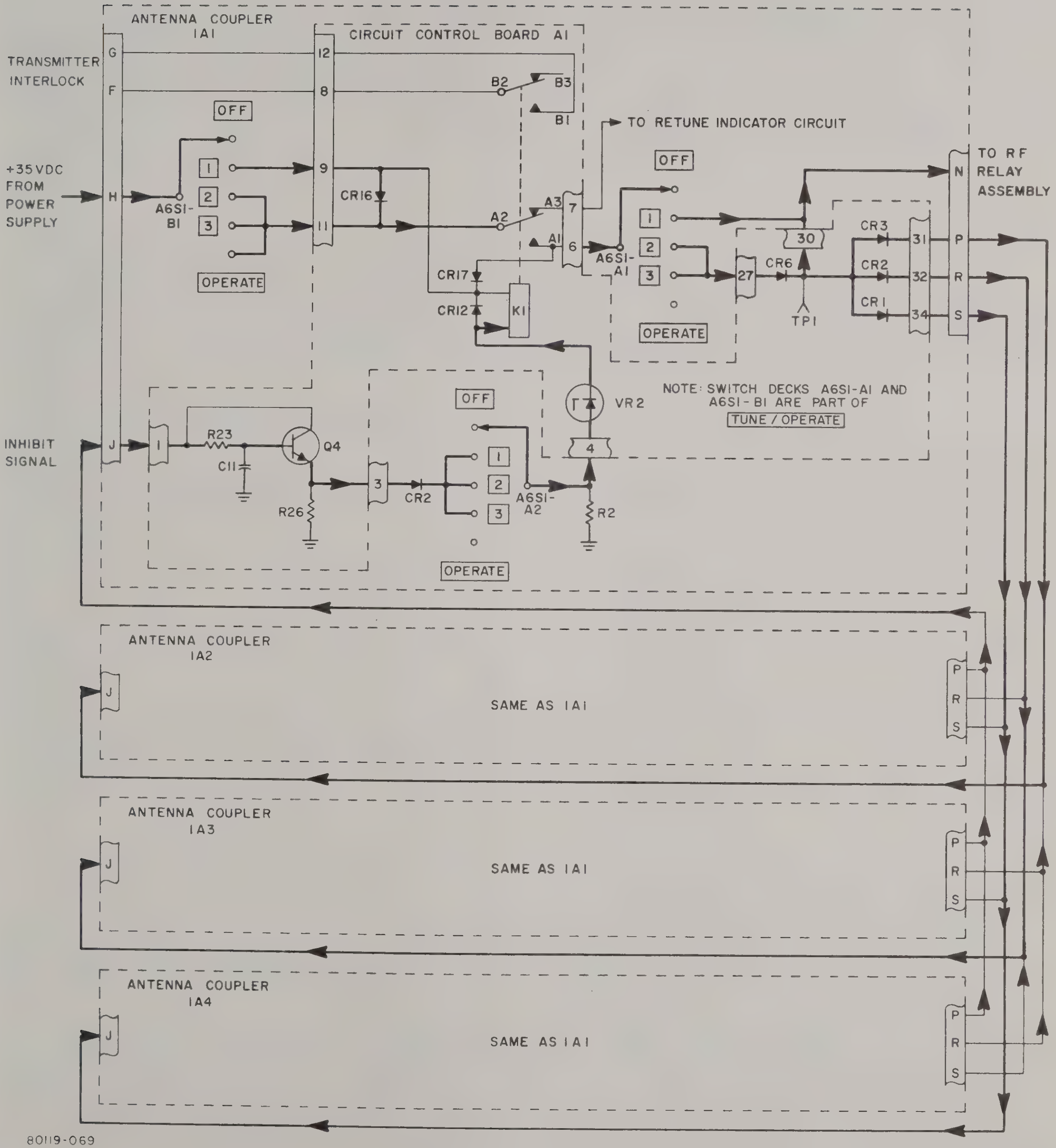

ANTENNA COUPLER 1A1
CIRCUIT CONTROL BOARD A1
TRANSMITTER INTERLOCK
+35 VDC FROM POWER SUPPLY
INHIBIT SIGNAL
G
F
H
J
12
8
9
11
B2
B3
B1
OFF
1
2
3
OPERATE
A6S1-B1
CR16
A2
A3
A1
7
6
CR17
CR12
K1
TO RETUNE INDICATOR CIRCUIT
A6S1-A1
27
CR6
30
TP1
CR3
CR2
CR1
31
32
34
N
P
R
S
TO RF RELAY ASSEMBLY
VR2
4
NOTE: SWITCH DECKS A6S1-A1 AND A6S1-B1 ARE PART OF TUNE / OPERATE
R23
C11
Q4
R26
CR2
A6S1-A2
R2
ANTENNA COUPLER 1A2
SAME AS 1A1
ANTENNA COUPLER 1A3
SAME AS 1A1
ANTENNA COUPLER 1A4
SAME AS 1A1
80119-069

Figure 4-14. RF Relay Control and Inhibit, Simplified Schematic Diagram

The time constant of the RC network formed by resistor A1R23 and capacitor A1C11 is approximately 20 milliseconds which provides a short delay to establish priority during tuning. When one antenna coupler is in the TUNE mode and an attempt is made to tune a second antenna coupler, the first antenna coupler will have priority,and the second will be shut down immediately since its transistor A1Q4 will already by at full conduction because of the inhibit signal produced at pin J by the first antenna coupler which is already in the TUNE mode. The second antenna coupler will produce an inhibit signal that will appear at pin J on the first antenna coupler since the second antenna coupler A1K1 contacts may momentarily close then open, but the duration of the inhibit signal is not long enough to cause transistor A1Q4 to conduct sufficiently to deenergize circuit control relay A1K1 in the first antenna coupler. Thus, the first antenna coupler will not shut down.

4.3.5.3.4.4.2 Test Data

The procedure for isolating a fault to the rf relay control and inhibit circuit consists of a logical choice based on observations of the status indicators during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of islating the fault to a particular component consists of continuity checks and testing of individual components. Test information concerning the rf relay control and inhibit circuit is presented in table 4-11.

TABLE 4-11. TEST DATA FOR RF RELAY CONTROL AND INHIBIT CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
M - J1-J/T	Inhibit input	Connect + lead to J1-J
Q - A1TP1	Monitors output of inhibit circuit	Connect + lead to TP1, - lead to chassis ground
U - J1-N/T	RF relay control signal	Connect + lead to J1-N
V - J1-P/T	Inhibit output 1	Connect + lead to J1-P
W - J1-R/T	Inhibit output 2	Connect + lead to J1-R
X - J1-S/T	Inhibit output 3	Connect + lead to J1-S
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraphs 5.2.1.5.1.3 and 5.2.1.5.4.3 for procedures to check rf relay and inhibit circuits
Multimeter	AN/PSM-4D	Used for continuity checks and component testing

TABLE 4-11. TEST DATA FOR RF RELAY CONTROL AND INHIBIT CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS		
Status Indicators	NORMAL	During normal operation as specified in Section 3 (Operator's Handbook)
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-14	
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-30 Figure 5-45	TUNE/OPERATE switch Circuit control board
Repair Procedures	Paragraph 5.3.1.7 Paragraph 5.3.1.17	
Fault Isolation Procedures	Paragraph 5.2.1.5.1.3 Paragraph 5.2.1.5.4.3	

4.3.5.3.4.5 Coupling Control Circuit

4.3.5.3.4.5.1 Functional Description

During the tuning procedures, the output coupling link must be in the minimum coupling position when tuning the input and output resonators, variable during loading of the antenna coupler, and in a coupled position when the antenna coupler becomes operational. A simplified schematic diagram of the coupling control is shown in figure 4-15.

The link coupling switch S1 is a microswitch that is operated to the NO or NC positions by the drive assembly on the OUTPUT COUPLING control. When the output coupling link is in the minimum coupling position switch S1 is operated to the NO position. If the control is not in this position, the switch is operated to the NC position.

When the TUNE/OPERATE switch is in any position but OFF, +35 vdc is applied to switch S1 through TUNE/OPERATE switch deck A6S1-B1. If the output coupling link is in the minimum coupling position, switch S1 applies the +35 vdc level to switch contacts on TUNE/OPERATE switch deck A6S1-B2 that correspond only to the OPERATE position. If the coupling link is not in this minimum position, switch S2 applies the +35 vdc level to the switch contacts on TUNE/OPERate switch deck A6S1-B2 that correspond to the TUNE-1 and TUNE-2 positions.

If the TUNE/OPERATE switch is in TUNE-1 or TUNE-2 and the output coupling link is in the minimum position (NO), the +35 vdc is not connected to the control relay circuit and thus has no affect on the proper operation of the antenna coupler. However, if the output coupling link is not in the minimum coupling position, +35 vdc is transferred to the anode of zener diode A1VR2 through the NC contact of switch S1, TUNE/OPERATE switch deck A6S1-B2, and pin 5 and diode A1CR13 on the circuit control board A1. When +35 vdc is applied to the anode of zener diode A1VR2, control relay A1K1 deenergizes and shuts down the antenna coupler.

When the TUNE/OPERATE switch is in TUNE-3 position, the output coupling link position has no effect since +35 vdc is not available at the switch contact on switch deck A6S1-B2 corresponding to the TUNE-3 position. When the TUNE/OPERATE switch is in OPERATE, +35 vdc is applied from switch S2 (NO) to zener diode A1VR2 to deenergize the circuit control relay A1K1 only if the coupling link remains in the minimum coupling position. This also shuts down the antenna coupler in the same manner as above.

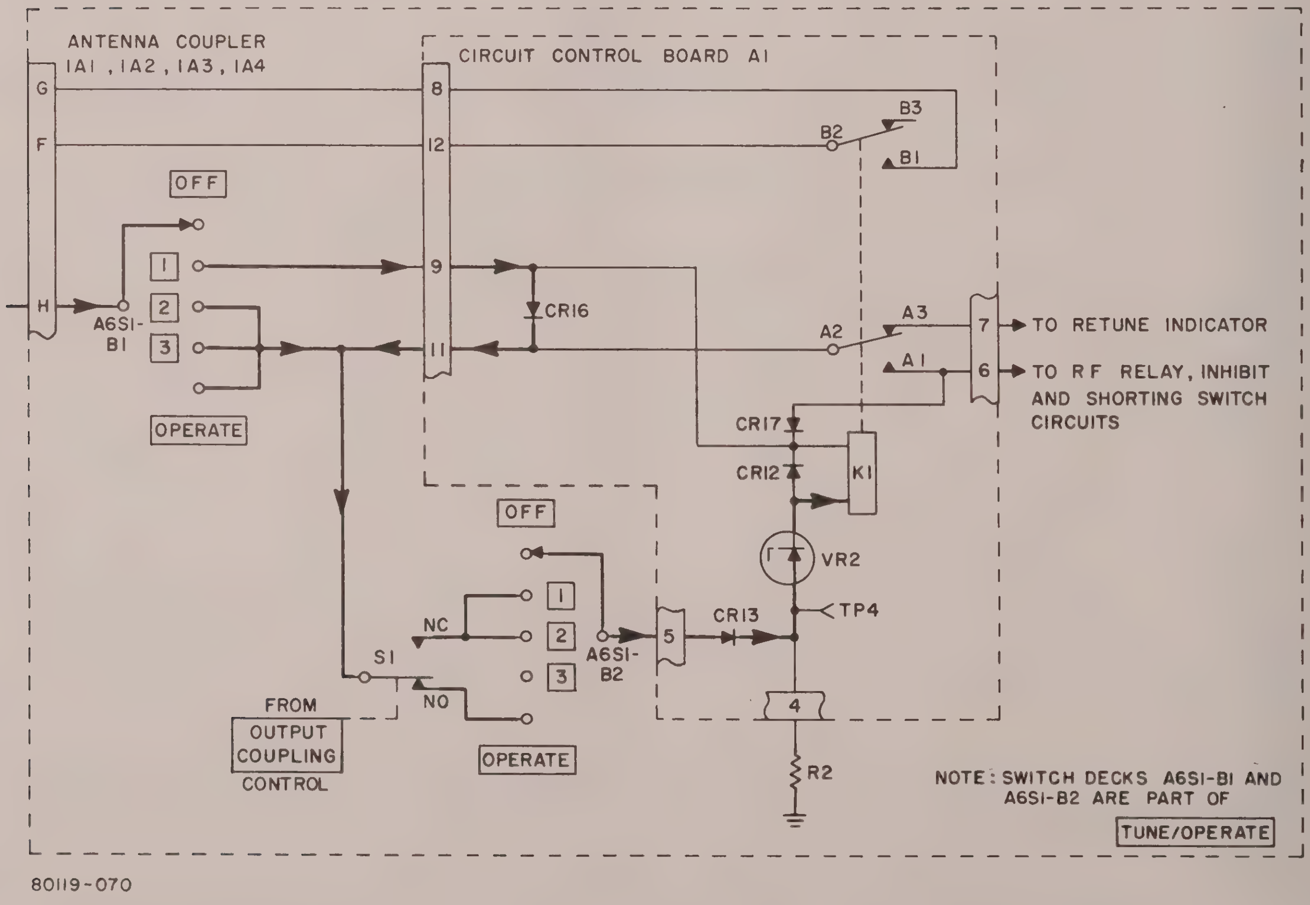

ANTENNA COUPLER
1A1, 1A2, 1A3, 1A4
CIRCUIT CONTROL BOARD A1
G
F
H
8
12
9
11
B3
B2
B1
OFF
1
2
3
OPERATE
A6S1-B1
CR16
A2
A3
A1
7
6
TO RETUNE INDICATOR
TO RF RELAY, INHIBIT AND SHORTING SWITCH CIRCUITS
CR17
CR12
K1
VR2
TP4
CR13
5
4
OFF
NC
S1
NO
A6S1-B2
FROM OUTPUT COUPLING CONTROL
R2
NOTE: SWITCH DECKS A6S1-B1 AND A6S1-B2 ARE PART OF TUNE/OPERATE
80119-070

Figure 4-15. Coupling Control Circuit, Simplified Schematic Diagram

4.3.5.3.4.5.2 Test Data

The procedure for isolating a fault to the coupling control circuit consists of a logical choice based on observations of the status indicators and transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component consists of continuity checks and testing of individual components. Test information concerning the coupling control circuit is presented in table 4-12.

TABLE 4-12. TEST DATA FOR COUPLING CONTROL CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
T - A1TP4	Relay operation	Connect + lead to TP1, - lead to chassis ground
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available
Multimeter	AN/PSM-4D	Use for checking continuity and component testing
PERFORMANCE INDICATORS		
Status Indicators	NORMAL	During normal operation as specified in Section 3 (Operator's Handbook)
Transmitter	Normal	
CRITICAL ADJUSTMENTS		
OUTPUT COUPLING	As specified by Section 3	For normal operation
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-15	
Detailed Schematic Diagram	Figure 5-51	

TABLE 4-12. TEST DATA FOR COUPLING CONTROL CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Parts Location	Figure 5-30 Figure 5-32 Figure 5-45	TUNE/OPERATE switch Coupling switch S2 Circuit control board
Repair Procedures	Paragraph 5.3.1.7 Paragraph 5.3.1.17	
Fault Isolation Procedures	Paragraph 5.2.1.5.1.2	

4.3.5.3.4.6 Loss-of-Air-Flow Control Circuit

4.3.5.3.4.6.1 Functional Description

The cooling fan in the antenna coupler removes the heat generated by the resonators in the rf section. If a loss-of-air-flow should occur because of a failure in the fan circuit, or if the flow should become inadequate because of a clogged air filter, the loss-of-air-flow control circuit will shut down the antenna coupler, light the AIR FLOW indicator in the monitoring section, and sound the audible ALARM on the power supply panel (see paragraph 4.3.5.3.3.3).

A simplified schematic diagram of the loss-of-air-flow control circuit is shown in figure 4-16. The cooling fan is driven from an ac source provided by the power distribution circuit through pins, X, W, and Y on antenna coupler receptacle J1. The air flow generated by the fan activates a vane-operated switch S2 located in the air stream of the fan. When the fan is operating and the air flow is normal, switch S2 closes to the NO contact which is connected to dc common. If the air flow becomes inadequate, the switch closes to the NO contact which is at +35 vdc.

When a loss-of-air-flow occurs, switch S2 applies +35 vdc to the control circuit through pin 10 on the circuit control board A1. This control circuit consists of a unijunction transistor (A1Q5) circuit that generates a pulse to trigger the gate of silicon controlled rectifier A1Q2. The control circuit operates in the following manner.

The +35 vdc voltage at pin 10 charges capacitor A1C10 through resistor A1R16 to raise the emitter of unijunction transistor A1Q5 toward the firing level. If switch S2 returns to the NO side (common) within approximately 7 seconds, the unijunction transistor A1Q5 will not trigger, and the voltage across capacitor A1C10 will discharge through diode A1CR5 resistor A1R10 and switch S2. The time constant of the discharge circuit (C10, R10) is 0.01 times that of the charge circuit (C10, R16). This delay circuit allows 7 seconds to enable the fans to reach full operating speed when ac is initially applied, and to eliminate the effects of switch flutter caused by turbulence in the air stream,without shutting down the antenna coupler.

If the switch S2 does not return to the NO contact, capacitor A1C10 continues to charge and reach the firing point of unijunction transistor (UJT) A1Q5. When transistor A1Q5 fires, a positive pulse is developed at Base 2 across capacitor C15 and resistor R20. The positive pulse is coupled to the gate of silicon controlled rectifier (SCR) A1Q2 through capacitor A1C13 while resistor A1R27 shunts a portion of the current around the SCR. When the gate of SCR A1Q2 is pulsed, the SCR conducts and the +35 vdc appears at the input to three circuits: audible alarm

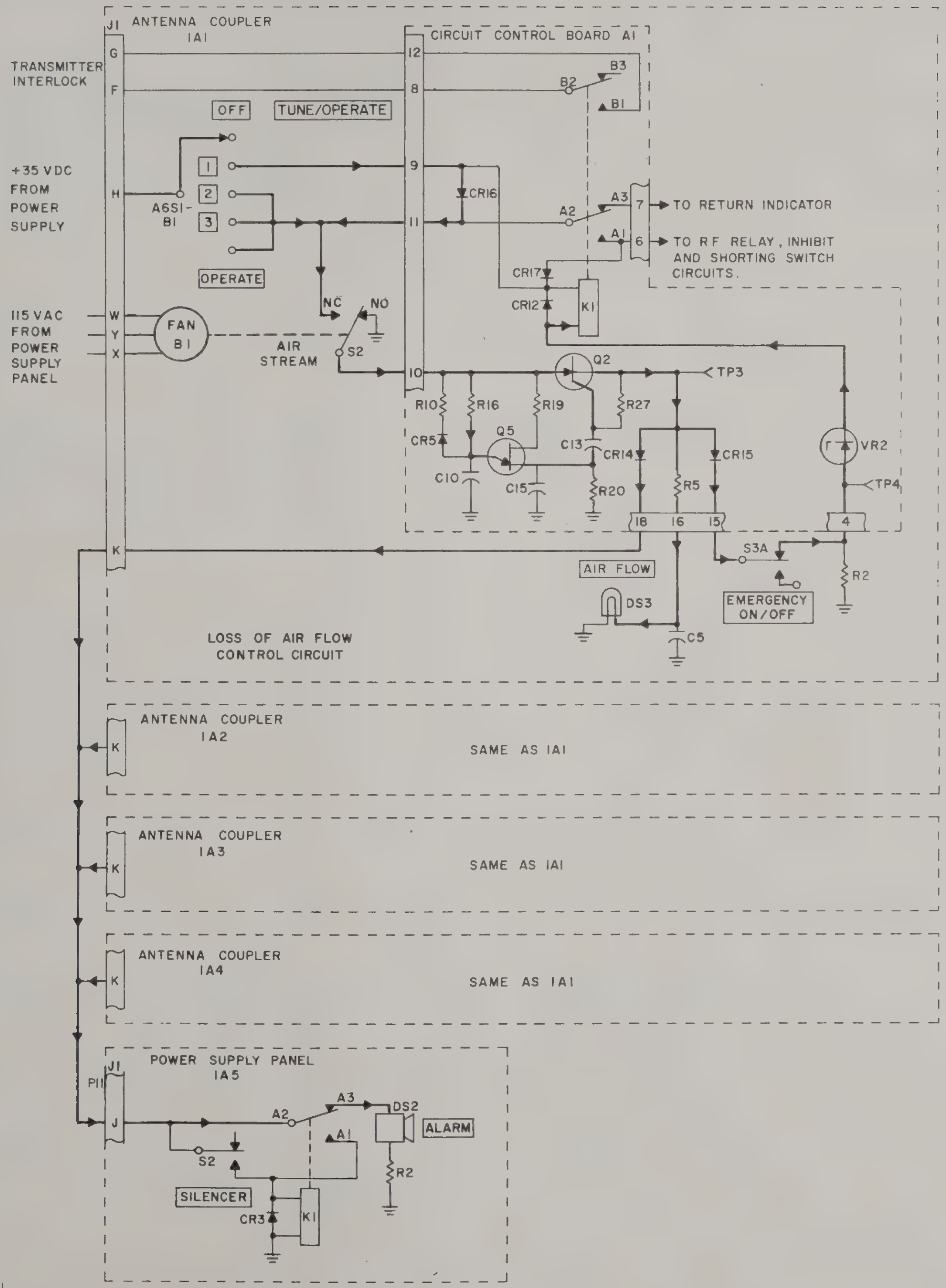

J1
ANTENNA COUPLER
1A1
CIRCUIT CONTROL BOARD A1
TRANSMITTER INTERLOCK
G
F
12
8
B2
B3
B1
OFF
TUNE/OPERATE
+35 VDC FROM POWER SUPPLY
H
A6S1-B1
1
2
3
9
11
CR16
A2
A3
A1
7
6
TO RETURN INDICATOR
TO RF RELAY, INHIBIT AND SHORTING SWITCH CIRCUITS.
OPERATE
CR17
CR12
K1
NC
NO
115 VAC FROM POWER SUPPLY PANEL
W
Y
X
FAN B1
AIR STREAM
S2
10
Q2
TP3
R10
R16
R19
R27
Q5
CR5
C13
CR14
CR15
VR2
C10
C15
R20
R5
TP4
18
16
15
4
K
S3A
AIR FLOW
R2
DS3
EMERGENCY ON/OFF
C5
LOSS OF AIR FLOW CONTROL CIRCUIT
ANTENNA COUPLER
1A2
SAME AS 1A1
ANTENNA COUPLER
1A3
SAME AS 1A1
ANTENNA COUPLER
1A4
SAME AS 1A1
POWER SUPPLY PANEL
1A5
J1
P11
J
A2
A3
DS2
ALARM
A1
S2
R2
SILENCER
CR3
K1
80119-071

Figure 4-16 Loss-of-Air-Flow Control Circuit, Simplified Schematic Diagram

(through diode A1CR14 and pin 18), AIR FLOW indicator (through resistor A1R5 and pin 16), and circuit control relay (through diode A1CR15, pin 15, EMERGENCY switch S3A, and pin 4 of the circuit control board).

The audible alarm circuit feeds the +35 vdc voltage through a common bus connected to all antenna couplers through pin K of the antenna coupler receptacle J1 to the audible ALARM circuit on the power supply panel in the base of the cabinet. The +35 vdc level appears at pin J of power supply receptacle J11 and is transferred to the sonic ALARM DS2 through relay 1A5K1 contacts A2-A3 and resistor 1A5R2 to ground. The sonic alarm can be silenced by pressing the SILENCER switch 1A5S2 which applies +35 vdc to relay 1A5K1. When the relay energizes, contacts A2-A1 close and lock the relay and contacts A2-A3 open to remove +35 vdc from the sonic alarm generator. Leads for a remote silencer are located on TB3-17 and -18.

The AIR FLOW indicator has been described under paragraph 4.3.5.3.3.3. Note, however, that capacitor C5 acts together with circuit control board resistor A1R27 to provide a path to ground for the ac components of the pulse that gates SCR A1Q2.

The +35 vdc signal appearing at EMERGENCY switch S3A from diode A1CR15 is applied across R2 to back bias zener diode A1VR2 raising the return side of control relay A1K1 to +35 vdc. This deenergizes the relay and shuts down the antenna coupler. However, operating the EMERGENCY switch S3 to ON removes the +35 vdc control signal and relay A1K1 remains energized to permit the antenna coupler to continue to operate in an emergency mode.

4.3.5.3.4.6.2 Test Data

The procedure for isolating a fault to the loss-of-air-flow control circuit consists of a logical choice based on observations of the status indicators, fan, AIR FLOW indicator, ALARM sonic generator, and transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component consists of continuity checks and testing of individual components within the circuit. Test information concerning the loss-of-air-flow control circuit is presented in table 4-13.

TABLE 4-13. TEST DATA FOR LOSS-OF-AIR-FLOW CONTROL CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
K - J1-K/T	Alarm circuit output	Connect + lead to J1-K
S - A1TP3	Loss-of-air-flow circuit output	Connect + lead to TP3, - lead to chassis ground
T - A1TP4	Relay operation	Connect + lead to TP4, - lead to chassis ground
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available

TABLE 4-13. TEST DATA FOR LOSS-OF-AIR-FLOW CONTROL CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
TEST EQUIPMENT (Continued)		
Multimeter	AN/PSM-4D	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
Status Indicator	NORMAL	
AIR FLOW	Out	For normal operation
ALARM	Silent	
EMERGENCY	OFF	
CRITICAL ADJUSTMENTS		
Air Flow Vane switch	S2	Air stream must close switch S2 when fan is operating properly
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-16	
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-5 Figure 5-30 Figures 5-43, 5-44, 5-45	Air flow vane switch S2 Fan Circuit control board
Repair Procedures	Paragraph 5.3.1.17	
Fault Isolation Procedure	Paragraph 5.2.1.5.1.1	

4.3.5.3.4.7 Excessive VSWR and Overvoltage Protective Circuits

4.3.5.3.4.7.1 Functional Description

In addition to a loss-of-air-flow, there are two operational conditions that, if uncontrolled, might cause damage to the antenna coupler or its associated transmitter. These conditions are an excessive reflected power caused by a high vswr, and an excessive output resonator voltage caused by a malfunction or maladjustment within the antenna coupler or coupler group. The control circuit shown in simplified schematic diagram in figure 4-17 protects the antenna coupler and transmitter from these two conditions.

An excessive reflected power as monitored by the operate reflectometer will appear at the circuit control board between pins 19 and 23. An excessive output resonator voltage will appear between pin 33 and ground. These two circuits operate in a manner similar to the loss-of-air-flow control circuit in that a unijunction transistor A1Q1 is used to trigger a silicon controlled rectifier A1Q3. Additional circuitry is provided to establish a more critical bias to the unijunction transistor and to filter the incoming signals.

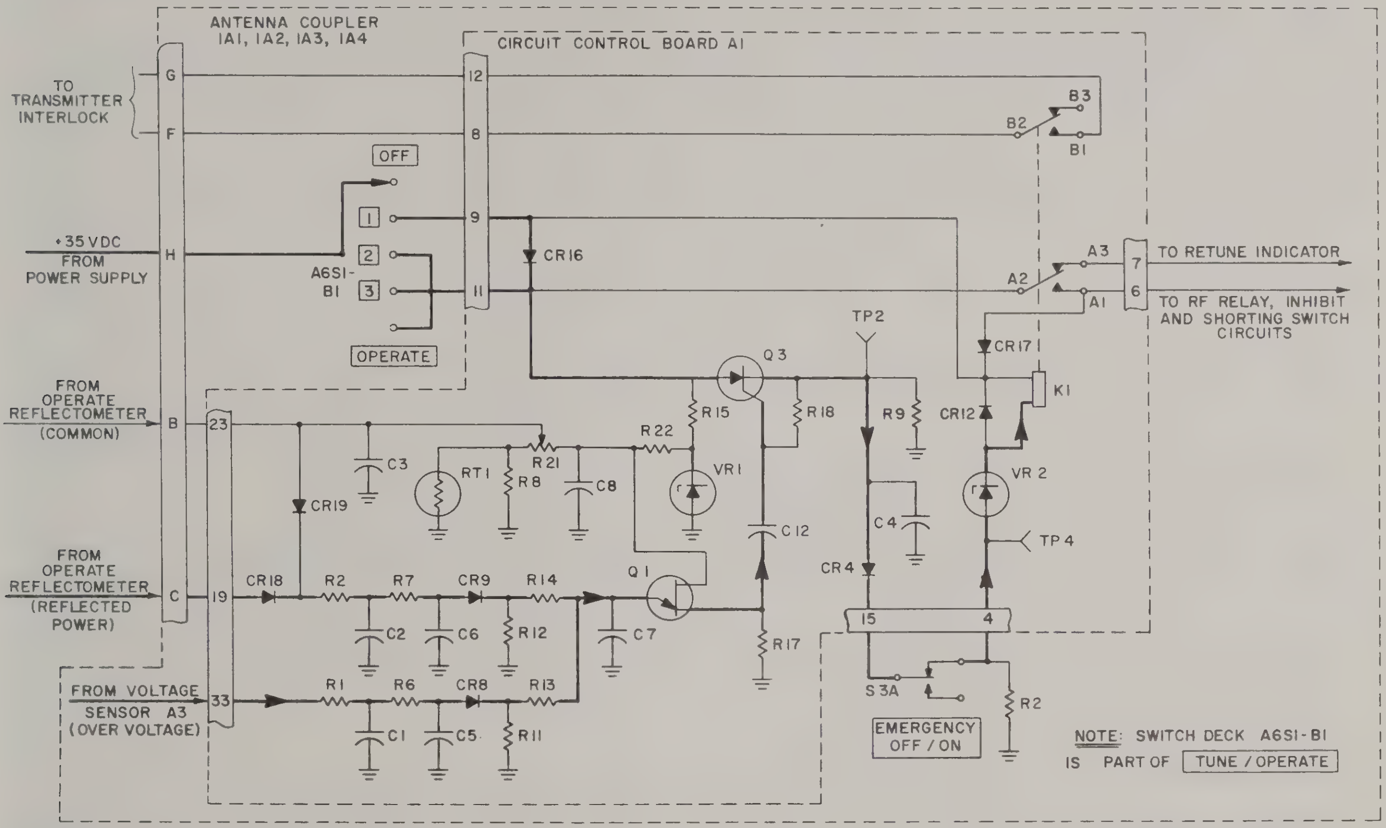
A voltage divider and regulator formed from resistors A1R15, A1R22, A1R21, A1R8, zener diode A1VR1, and thermister A1RT1 provides the proper bias for unijunction transistor A1Q1. A portion of the voltage established by the voltage regulator is applied to the emitter of unijunction transistor A1Q1 through potentiometer A1R21 and isolating diode A1CR19. This in effect raises the small voltage presented by the operate reflectometer to the level necessary to fire the unijunction transistor, since these two voltages appear in series through the common return of the reflectometer. In this circuit, capacitors A1C3 and A1C8 bypass any rf and provide filtering for the voltage regulator.

When the reflected power becomes excessive, the dc signal generated by the operate reflectometer appears between pins 19 and 23 of the circuit control board (from pins C and B, respectively, of receptacle J1), and is fed through the diode A1CR18 to a low pass filter to eliminate the variation of signal level caused by the modulation envelope of the transmitter rf. The voltage is then applied through diode A1CR9 to a second filter network A1R12, A1R14, and A1C7 which also provides a discharge path for capacitor A1C7 if the signal voltage drops off before the firing point of unijunction transistor A1Q1 is reached. This eliminates transient and rapidly fluctuating signals from activating the protective circuit.

When capacitor A1C7 changes to the required level, transistor A1Q1 conducts and a positive pulse appears across resistor A1R17. This positive pulse is coupled to the gate of SCR A1Q3 with a part of the pulse current shunted around A1Q3 through resistor A1R18. The ac components of the positive pulse are also shunted to ground through resistor A1R9 and capacitor A1C4. When the gate of SCR A1Q3 is pulsed, the SCR conducts and +35 vdc from switch deck A6S1-B1 is applied to the relay control circuits through diode A1CR4 and pin 15 on the circuit control board, and EMERGENCY switch S3. This voltage back biases zener diode A1VR2 and deenergizes control relay A1K1 as described in paragraph 4.3.5.3.4.1.

The operation of the output resonator overvoltage protective circuit is nearly identical to the excessive vswr protective circuit. However, the voltage developed by the output voltage sensor A3 (paragraph 4.3.5.3.3.1) applied between pin 33 and ground is large enough to drive the control circuit without the need for additional voltage supplied from the voltage regulator. The signal from voltage sensor A3 is applied to pin 33, low pass filter A1R1, A1C1, A1R6, A1C5, diode A1CR8, and filter A1R11, A1R13, and A1C7 in the same manner as for the excessive vswr protective circuit, and the remainder of the control circuit is identical.

Either of these two conditions can be bypassed by operating the EMERGENCY switch S3 to ON which removes the +35 vdc from zener diode A1VR2. This permits the control relay A1K1 to remain energized and permits the antenna coupler to be operated in an emergency mode.


ANTENNA COUPLER
1A1, 1A2, 1A3, 1A4
CIRCUIT CONTROL BOARD A1
TO TRANSMITTER INTERLOCK
G
F
H
B
C
12
8
9
11
B3
B2
B1
OFF
1
2
3
OPERATE
A6S1-B1
+35 VDC FROM POWER SUPPLY
CR16
A3
A2
A1
7
6
TO RETUNE INDICATOR
TO RF RELAY, INHIBIT AND SHORTING SWITCH CIRCUITS
TP2
CR17
Q3
K1
R15
R18
R9
CR12
FROM OPERATE REFLECTOMETER (COMMON)
23
R22
R21
C3
RT1
R8
C8
VR1
VR 2
CR19
C12
C4
TP 4
FROM OPERATE REFLECTOMETER (REFLECTED POWER)
19
CR18
R2
R7
CR9
R14
Q1
CR4
15
4
C2
C6
R12
C7
R17
FROM VOLTAGE SENSOR A3 (OVER VOLTAGE)
33
R1
R6
CR8
R13
S3A
R2
C1
C5
R11
EMERGENCY OFF / ON
NOTE: SWITCH DECK A6S1-B1 IS PART OF TUNE / OPERATE

80119-072

Figure 4-17. Excessive VSWR and Overvoltage Protective Circuits, Simplified Schematic Diagram

4.3.5.3.4.7.2 Test Data

The procedure for isolating a fault to the excessive vswr or overvoltage circuits consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters, status indicators, and transmitter performance during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit and component consists of continuity checks and testing of the individual circuits. Test information concerning the excessive vswr and overvoltage circuits is presented in table 4-14.

TABLE 4-14. TEST DATA FOR EXCESSIVE VSWR AND OVERVOLTAGE PROTECTIVE CIRCUITS

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Excessive VSWR Circuit Bias	0 to 1.335 vdc measured between J1-B/C	Connect + lead to J1-B

TABLE 4-14. TEST DATA FOR EXCESSIVE VSWR AND OVERVOLTAGE PROTECTIVE CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS (Continued)		
Trip Voltage	1.335 vdc applied between J1-B/C	Connect + lead to J1-B
Overvoltage Trip Voltage	15 vdc applied between XA1-33/gnd	Connect + lead to XA1-33
TEST POINTS		
F - J1-C/B	Trip voltage for excessive vswr	Connect + lead to J1-C
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
L - J1-B/T	Bias voltage measurement	Connect + lead to J1-B
R - A1TP2	Output of protective circuits	Connect + lead to TP2, - lead to chassis ground
T - A1TP4	Relay operation	Connect + lead to TP4, - lead to chassis ground
Y- XA1-33/gnd	Trip voltage for over-voltage	Connect + lead to XA1-33
TEST EQUIPMENT		
Power Supply	+35 vdc	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraphs 5.2.1.5.4.4 and 5.2.1.5.4.6
Multimeter	AN/PSM-4D	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
Status Indicators	NORMAL	Normal operation as specified in Section 3 (Operator's Handbook)
EMERGENCY	OFF	
CRITICAL ADJUSTMENTS		
Bias Adjustment	A1R21	Sets bias to fire unijunction A1Q1 See paragraph 5.2.1.5.4.4

TABLE 4-14. TEST DATA FOR EXCESSIVE VSWR AND OVERVOLTAGE PROTECTIVE CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-17	
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figures 5-43, 5-44, 5-45	Circuit control board
Repair Procedures	Paragraph 5.3.1.17	
Calibration Procedure	Paragraphs 5.2.1.5.4.4 and 5.2.1.5.4.6	

4.3.6 Combiner

Each coupler group contains a four-channel combiner. The combiners in all three coupler groups are identical in function but differ in physical and electrical configuration.

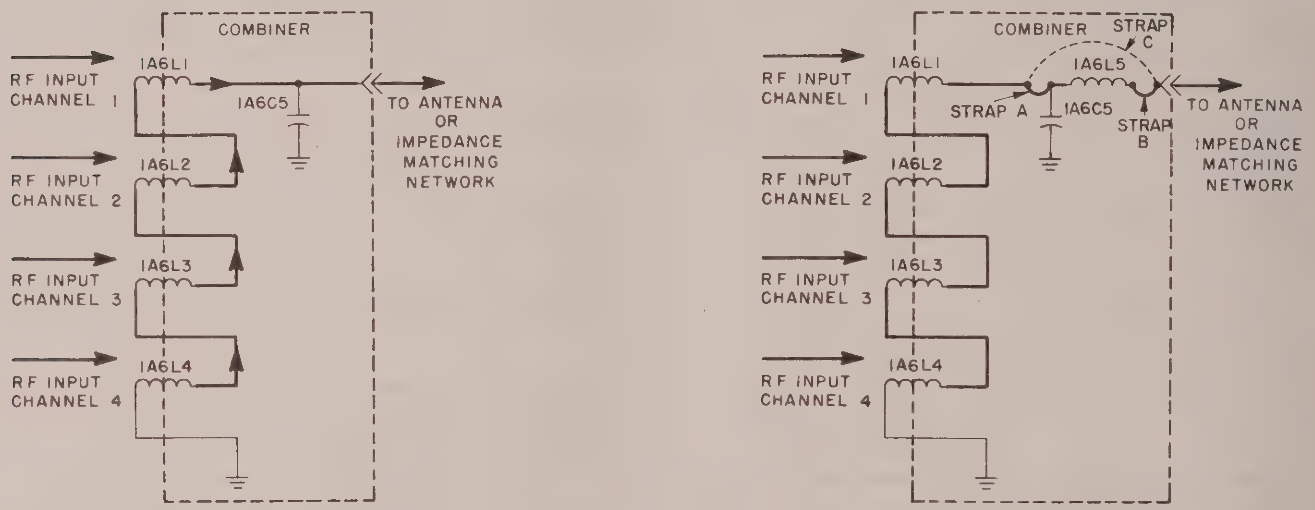
4.3.6.1 Functional Description

The combiner accepts the rf outputs from each of the four antenna couplers and produces a composite rf output for delivery to the antenna or impedance matching network. The four rf outputs are combined so that the impedances are matched and transformed to the required level (50 ohms for a 3:1 vswr load) as seen by each antenna coupler.

4.3.6.2 Circuit Description

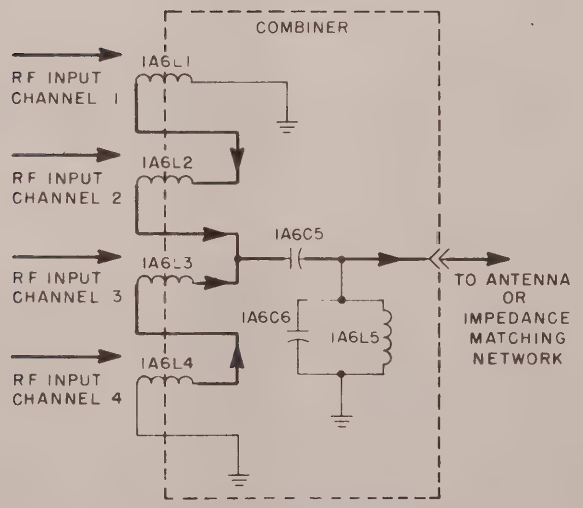
A simplified schematic diagram of the combiners used for each coupler group is shown in figure 4-18. RF power is coupled out of each of the four antenna couplers by the four output coupling links 1A6L1, 1A6L2, 1A6L3, 1A6L4. These links are connected in series and to the combining network by a flexible strip transmission line. In Antenna Coupler Group AN/SRA-56, the combining network consists of shunt capacitor 1A6C5 connected across the output links at the top of link 1A6L1; in Antenna Coupler Group AN/SRA-57, by a shunt capacitor 1A6C5 and series inductor 1A6L5 across the output links at the top of link 1A6A1 (4-channel operation only); and in Antenna Coupler Group AN/SRA-58, by series capacitor 1A6C5 and parallel-connected capacitor 1A6C6 and inductor 1A6L5. For Antenna Coupler Group AN/SRA-58, the network is connected to the output links at the center between links 1A6L2 and 1A6L3 with the top link 1A6L1 and bottom link 1A6L4 connected to chassis ground. In all groups, the rf output appears at 1A6J1.

When Antenna Coupler Group AN/SRA-57 operates as a single 4-channel coupler group, the combining network (1A6C5, 1A6L5) is strapped in by straps A and B as shown in figure 4-18. However, when two of these coupler groups are combined to form an eight-channel configuration,


COMBINER
RF INPUT CHANNEL 1
1A6L1
1A6C5
TO ANTENNA OR IMPEDANCE MATCHING NETWORK
RF INPUT CHANNEL 2
1A6L2
RF INPUT CHANNEL 3
1A6L3
RF INPUT CHANNEL 4
1A6L4
COMBINER
STRAP C
1A6L5
STRAP A
1A6C5
STRAP B
TO ANTENNA OR IMPEDANCE MATCHING NETWORK

ANTENNA COUPLER GROUP
AN/SRA-56 (2 TO 6 MC)

ANTENNA COUPLER GROUP
AN/SRA-57 (4 TO 12 MC)


COMBINER
RF INPUT CHANNEL 1
1A6L1
RF INPUT CHANNEL 2
1A6L2
1A6C5
RF INPUT CHANNEL 3
1A6L3
1A6C6
1A6L5
TO ANTENNA OR IMPEDANCE MATCHING NETWORK
RF INPUT CHANNEL 4
1A6L4
80119-073

ANTENNA COUPLER GROUP
AN/SRA-58 (10 TO 30 MC)

Figure 4-18. Combiner, Simplified Schematic Diagram

the combining network must be strapped out on both units by removing straps A and B and installing strap C. This in effect, bypasses the combining network and applies the rf output signals directly to the impedance matching network where all eight rf outputs are combined and fed to the antenna.

The combiner is mounted to the rear of the electrical equipment cabinet so that the output links will extend into the antenna coupler to coupler the rf energy out of the output resonator. The individual output links are mounted on a slide mechanism that permits the link to move horizontally in and out of the associated antenna coupler. This mechanical mount is controlled by the OUTPUT COUPLING control on the antenna coupler through a chain drive assembly, link drive screw shaft, and mating block (see paragraph 4.3.5.3.2.4).

4.3.6.3 Test Data

The procedure for isolating a fault to the combiner consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters, control setting, status indicators, and transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component consists of testing of individual components and continuity checks. Test information concerning the combiner is presented in table 4-15.

TABLE 4-15. TEST DATA FOR COMBINER

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Maximum VSWR Load	3.0 to 1	
RF Power Rating	4 kw average, 8 kw p-e-p	
Insertion Loss	0.1 db	
TEST POINTS		
15 - 1A1J1, 1A2J1, 1A3J1, 1A4J1 16 - 1A6J1	Insertion loss measurements	Measured through antenna coupler
TEST EQUIPMENT		
As specified in paragraph 5.2.1.5.5.1		
Multimeter	AN/PSM-4D	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
RF POWER FORWARD	As specified in Section 3 (Operator's Handbook)	All antenna couplers in the group

TABLE 4-15. TEST DATA FOR COMBINER (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS (Continued)		
RF POWER REFLECTED	As specified in Section 3	All antenna couplers in the group
Status Indicators	As specified in Section 3	All antenna couplers in the group
CRITICAL ADJUSTMENTS		
FREQ ADJUST INPUT	As specified by Section 3	All antenna couplers in the group
FREQ ADJUST OUTPUT	As specified by Section 3	All antenna couplers in the group
OUTPUT COUPLING	As specified by Section 3	All antenna couplers in the group
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	
Simplified Schematic Diagram	Figure 4-18	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figures 5-37 through 5-39	
Repair Procedures	Paragraph 5.3.1.15	

4.3.7 Impedance Matching Network CU-1773/SRA-56 and CU-1775/SRA-57

The impedance matching network enables two of the same coupler groups to be combined to form an eight-channel configuration. Impedance Matching Network CU-1773/SRA-56 operates with two Antenna Coupler Groups AN/SRA-56 (2 to 6 mc); Impedance Matching Network CU-1775/SRA-57 operates with two Antenna Coupler Groups AN/SRA-57 (4 to 12 mc).

4.3.7.1 Functional Description

The impedance matching network operates in a manner similar to the combining network (see paragraph 4.3.6) to combine the rf outputs from the two coupler groups and match the impedance characteristics for maximum transfer of power. The impedance matching network matches the impedance of the common broadband antenna to the output characteristics of the antenna coupler groups. The vswr of the antenna may be as high as 3 to 1 over the operating frequency of the antenna coupler group, but the impedance matching network, in conjunction with the associated antenna coupler (channel),will transform this vswr to 1.05 to 1 at the channel inputs to the coupler groups.

4.3.7.2 Circuit Description

A simplified schematic diagram of the two impedance matching networks (CU-1773/SRA-56 and CU-1775/SRA-57) is shown in figure 4-19. The configuration of these networks depends upon the frequency range of the coupler groups with which they are associated. RF power is applied to the impedance matching network through 1P1 and 1P2 (connected to 1A6J1 on the combiner of the two coupler groups).

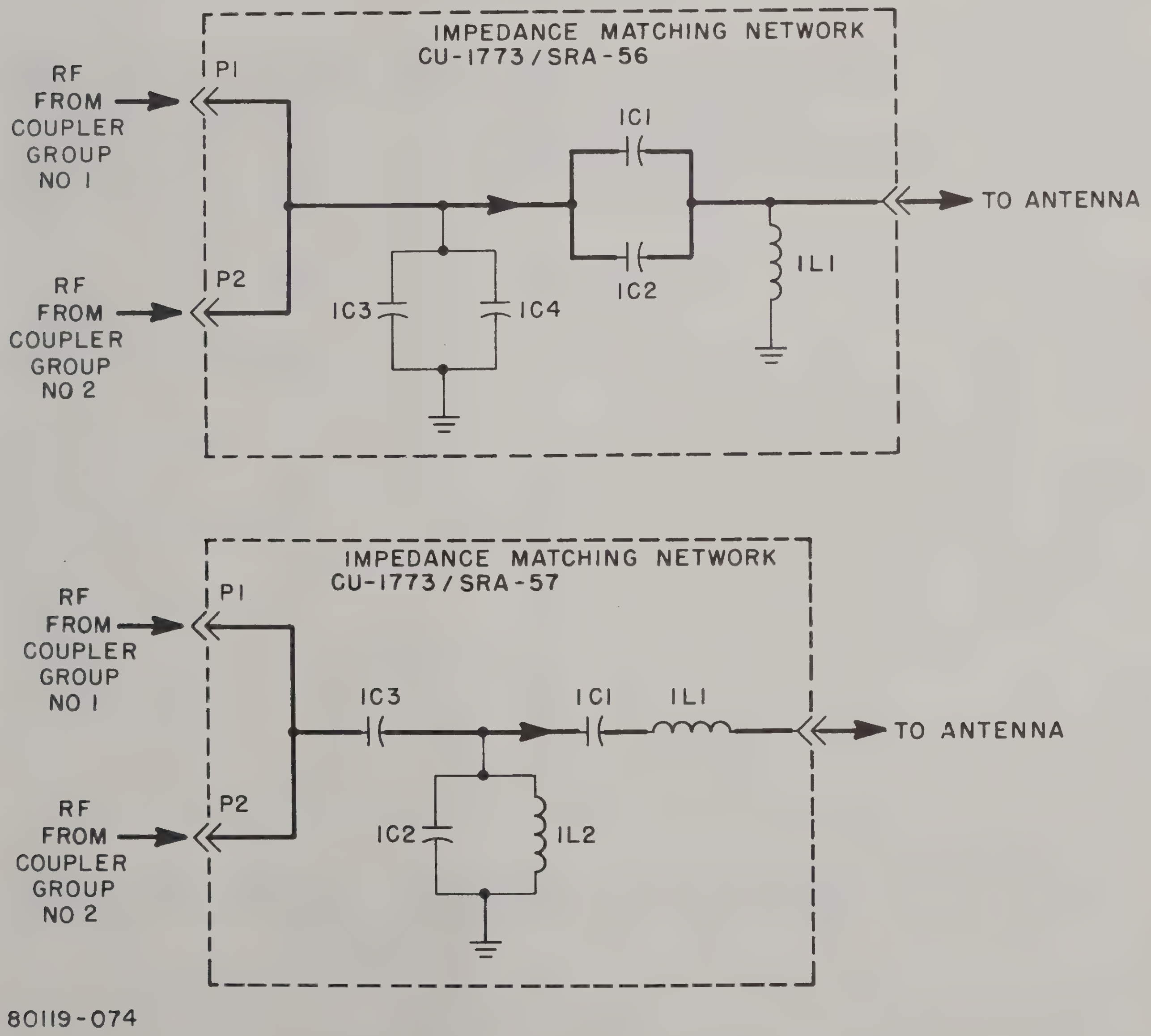

IMPEDANCE MATCHING NETWORK
CU-1773/SRA-56
RF FROM COUPLER GROUP NO 1
P1
RF FROM COUPLER GROUP NO 2
P2
1C1
1C2
1C3
1C4
1L1
TO ANTENNA
IMPEDANCE MATCHING NETWORK
CU-1773/SRA-57
RF FROM COUPLER GROUP NO 1
P1
RF FROM COUPLER GROUP NO 2
P2
1C3
1C1
1L1
1C2
1L2
TO ANTENNA
80119-074

Figure 4-19. Impedance Matching Networks CU-1773/SRA-56 and CU-1775/SRA-57, Simplified Schematic Diagrams

Impedance Matching Network CU-1773/SRA-56, associated with Antenna Coupler Group AN/SRA-56, covers the 2- to 6-mc frequency range and consists of shunt capacitors 1C3 and the series-parallel network formed from capacitors 1C1 and 1C2, and shunt inductor 1L1. Impedance Matching Network CU-1775/SRA-57, associated with Antenna Coupler Group AN/SRA-57, covers the 4- to 12-mc frequency range and consists of series capacitor 1C3, shunted by the parallel network formed from capacitor 1C2 and inductor 1L2, and series peaking network made up of capacitor 1C1 and inductor 1L1. The output of the impedance matching network is delivered to the antenna through receptacle 1J1.

The network is capable of handling eight channels simultaneously. Thus, the rf power rating of the impedance matching network is 8 kw average or 16 kw peak envelope power (p-e-p).

4.3.7.3 Test Data

The procedure for isolating a fault to the impedance matching network consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters, status indicators, and transmitters associated with both coupler groups during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component within the impedance matching network consists of testing of individual components and continuity checks. Test information concerning the impedance matching network is presented in table 4-16.

TABLE 4-16. TEST DATA FOR IMPEDANCE MATCHING NETWORK

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Maximum VSWR Load	3 to 1	
RF Power Rating	8 kw average, 16 kw p-e-p	
Insertion Loss	0.2 db	
TEST POINTS		
17 - 1P1 18 - 1P2 19 - 1J1	Insertion loss measurement	Measured through antenna coupler
TEST EQUIPMENT		
As specified in paragraph 5.2.1.5.5.1		
Multimeter	AN/PSM-4D	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
RF POWER FORWARD	As specified in Section 3	All antenna couplers in both coupler groups

TABLE 4-16. TEST DATA FOR IMPEDANCE MATCHING NETWORK (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS (Continued)		
RF POWER REFLECTED	As specified in Section 3	All antenna couplers in both coupler groups
Status Indicators	As specified in Section 3	All antenna couplers in both coupler groups
CRITICAL ADJUSTMENTS		
FREQ ADJUST INPUT	As specified in Section 3	All antenna couplers in both coupler groups
FREQ ADJUST OUTPUT	As specified in Section 3	All antenna couplers in both coupler groups
OUTPUT COUPLING	As specified in Section 3	All antenna couplers in both coupler groups
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	
Simplified Schematic Diagram	Figure 4-19	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figures 5-41, 5-42	
Repair Procedures	Paragraph 5.3.1.16	

4.3.8 Power Supply PP-4493/SRA (Power Supply Panel 1A5)

The power supply panel contains a +35 vdc power supply, ac distribution circuits, and audible ALARM circuits (see paragraph 4.3.5.3.4.6). All power supply panels are identical in functional circuitry and are completely interchangeable between antenna coupler groups.

4.3.8.1 Functional Description

The ac/dc power circuits consist of a line filter, fused ac input circuit, +35 vdc power supply, and ac and dc distribution circuits. Primary power enters the equipment cabinet through a line filter which provides a means of elimination of any rf signal from the ac input, and through fuses that protect power supply panel 1A5 from overload. The ac power is delivered to the ac distribution circuits and, in parallel, to the +35 vdc power supply. The ac distribution circuits

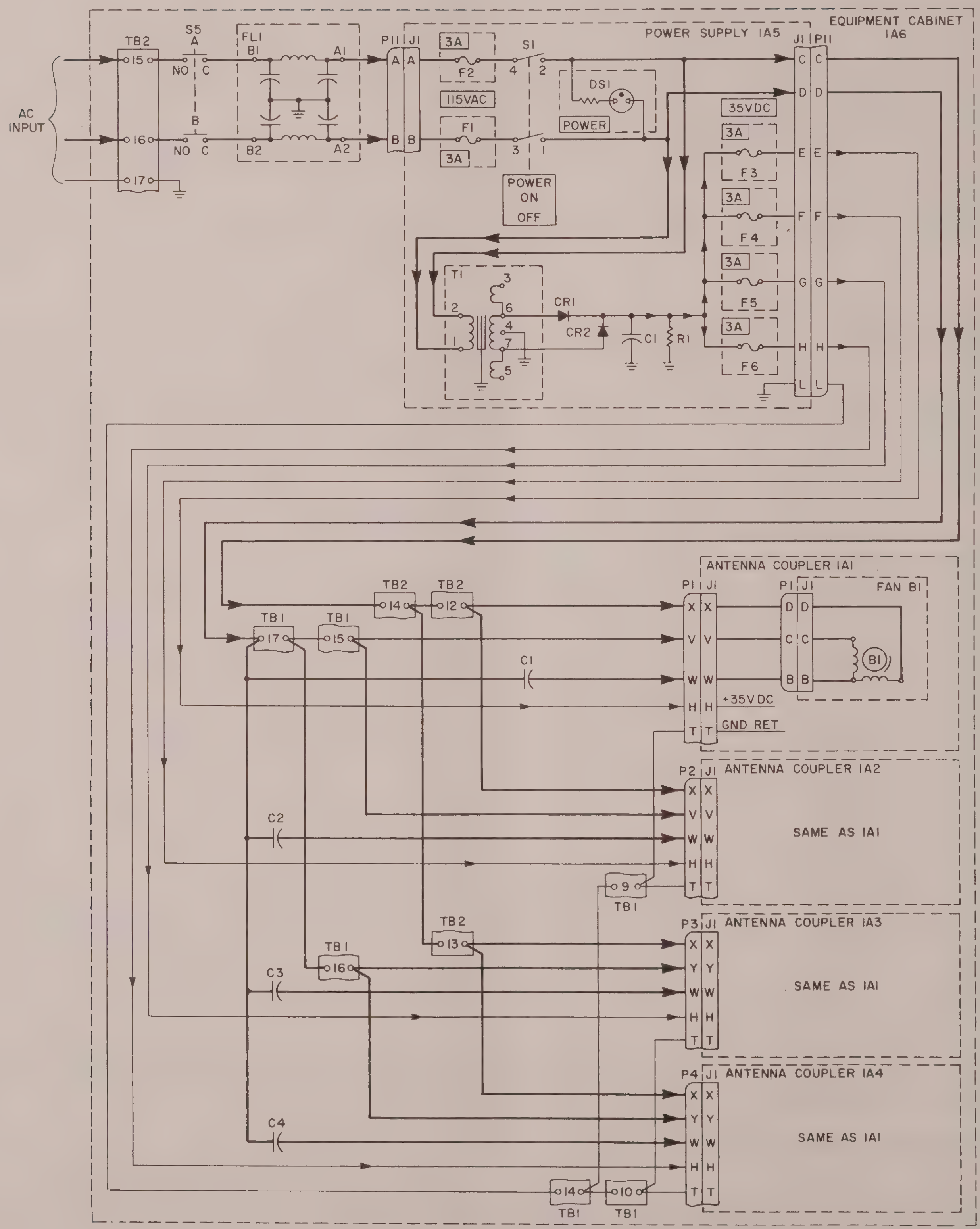

AC INPUT
TB2
15
16
17
S5
A
B
NO
C
FL1
B1
A1
B2
A2
P11
J1
A
B
3A
F2
115VAC
F1
S1
4
2
3
POWER ON OFF
POWER SUPPLY 1A5
DS1
POWER
35VDC
F3
F4
F5
F6
T1
1
2
3
4
5
6
7
CR1
CR2
C1
R1
J1
P11
C
D
E
F
G
H
L
EQUIPMENT CABINET 1A6
ANTENNA COUPLER 1A1
P1
J1
X
V
W
H
T
FAN B1
B1
+35VDC
GND RET
TB2
14
12
13
TB1
17
15
16
9
14
10
C1
C2
C3
C4
ANTENNA COUPLER 1A2
P2
SAME AS 1A1
ANTENNA COUPLER 1A3
P3
Y
ANTENNA COUPLER 1A4
P4
80119-016

Figure 4-20. AC/DC Power Circuit, Simplified Schematic Diagram

feed the ac to the antenna couplers where it is used to drive the cooling fans. The power supply converts the ac to +35 vdc and delivers this voltage through fused dc distribution circuits to the control circuits in each antenna coupler.

4.3.8.2 Circuit Description

A simplified schematic diagram of the ac/dc power circuits is shown in figure 4-20. As shown in this figure, ac enters the coupler group equipment cabinet through terminal board TB2-15/16/17 power supply panel interlock 1A6S5, rf filter FL1 and plug receptacle P11/J1-A/B. The ac is fed through indicator fuses F1 and F2, POWER-ON/OFF switch 1A5S1, and POWER indicator DS1 to the ac distribution circuits through J1-C/D, and to supply transformer T1. The power supply is a conventional half-wave rectifier with a filter formed by 1A5C1 and bleeder resistor 1A5R1. (These circuits are described in detail in NAVSHIPS 0967-000-0120, Electronic Installation and Maintenance Book.) The dc power is distributed to each antenna coupler in the coupler group through four indicator fuse circuits.

The ac circuits include capacitors 1A6C1, 1A6C2, 1A6C3 and 1A6C4. These are starting capacitors for the fans in antenna couplers 1A1, 1A2, 1A3, and 1A4, respectively.

4.3.8.3 Test Data

The procedure for isolating a fault to the power supply and circuits consists of a logical choice based on observations of the status indicators on all antenna couplers and all transmitters during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component consists of testing of individual components and continuity checks. Test information concerning the power supply panel is presented in table 4-17.

TABLE 4-17. TEST DATA FOR POWER SUPPLY PANEL

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
AC Input	115 vac, 60 cps, single phase, 200 watts	
AC Output	115 vac, 60 cps, single phase	
DC Output	+40 vdc, unloaded +35 vdc, loaded	
Circuit Protection		
AC Fuses	115 vac, 3 amperes	
DC Fuses	35 vdc, 3 amperes	
TEST POINTS		
20 - TB2-15/16	115 vac input	
21 - J11-C/D	115 vac output	

TABLE 4-17. TEST DATA FOR POWER SUPPLY PANEL (Continued)

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS (Continued)		
22 - J11-E/L, -F/L, G/L, -H/L	+35 vdc output	Connect + lead to J11-E, F, G, or H
23 - J11-J/L	Audible ALARM	Connect + lead to J11-J
24 - J11-K/L	ALARM remote silencer	Connect + lead to J11-K
TEST EQUIPMENT		
Power Supply	35 vdc	Check operation of audible ALARM
Voltage Source	115 vac	
Multimeter	AN/PSM-4D	Voltage measurements continuity checks and component testing
PERFORMANCE INDICATORS		
POWER Indicator	ON	
Status Indicator	NORMAL	All antenna couplers in the group
Fuse Indicators	Out	
ALARM	Off	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-25	
Simplified Schematic Diagram	Figure 4-20	
Detailed Schematic Diagram	Figure 5-49	
Parts Location	Figure 5-21	
Repair Procedures	Paragraph 5.3.1.2	

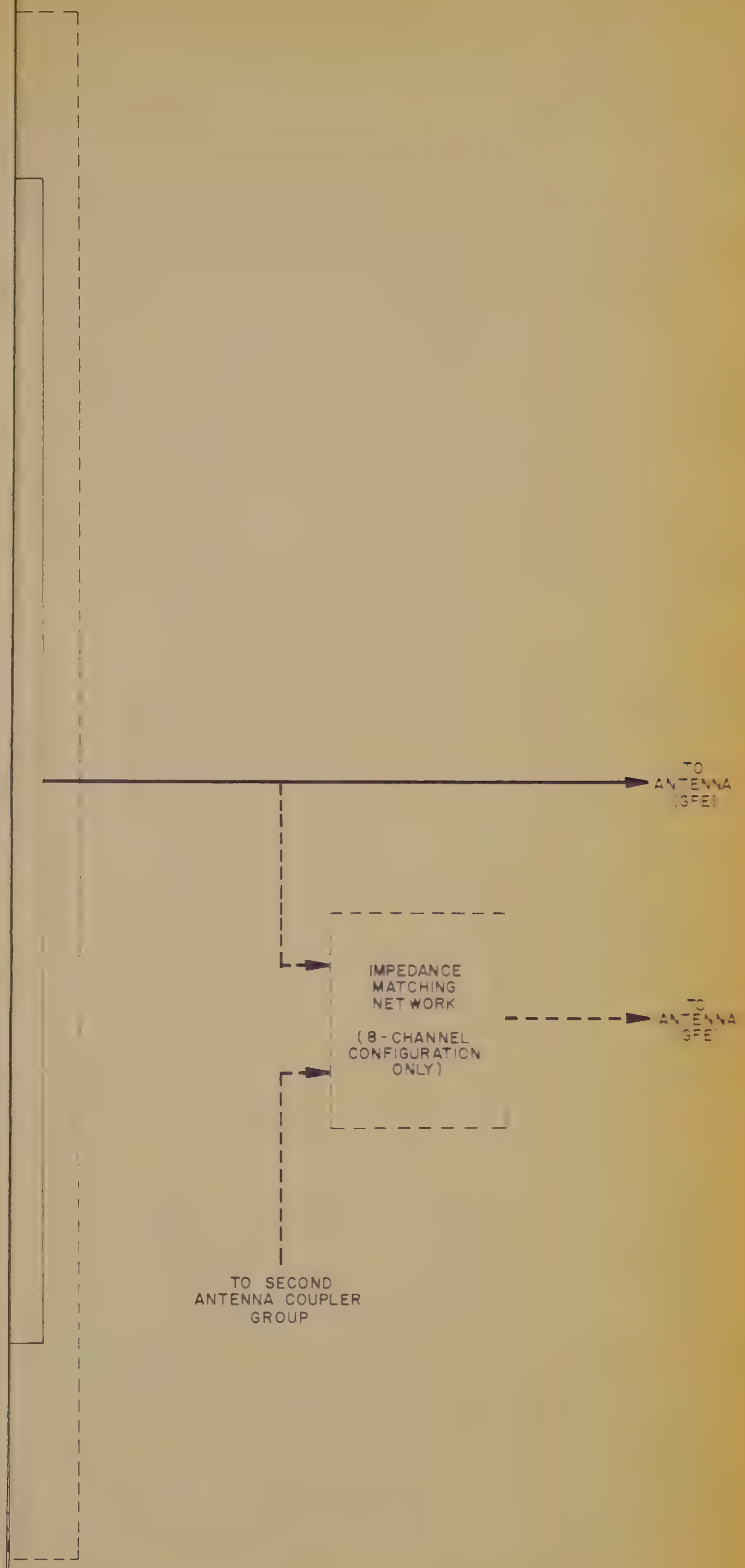

TO ANTENNA (GFE)
IMPEDANCE MATCHING NETWORK
(8-CHANNEL CONFIGURATION ONLY)
TO ANTENNA (GFE)
TO SECOND ANTENNA COUPLER GROUP

Figure 4-21 Antenna Coupler Group AN/SRA-56, AN/SRA-57, or AN/SRA-58, Overall Functional Block Diagram

TABLE 4-17. TEST DATA FOR POWER SUPPLY PANEL (Continued)

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS (Continued)		
22 - J11-E/L, -F/L, G/L, -H/L	+35 vdc output	Connect + lead to J11-E, F, G, or H
23 - J11-J/L	Audible ALARM	Connect + lead to J11-J
24 - J11-K/L	ALARM remote silencer	Connect + lead to J11-K
TEST EQUIPMENT		
Power Supply	35 vdc	Check operation of audible ALARM
Voltage Source	115 vac	
Multimeter	AN/PSM-4D	Voltage measurements continuity checks and component testing
PERFORMANCE INDICATORS		
POWER Indicator	ON	
Status Indicator	NORMAL	All antenna couplers in the group
Fuse Indicators	Out	
ALARM	Off	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-25	
Simplified Schematic Diagram	Figure 4-20	
Detailed Schematic Diagram	Figure 5-49	
Parts Location	Figure 5-21	
Repair Procedures	Paragraph 5. 3. 1. 2	

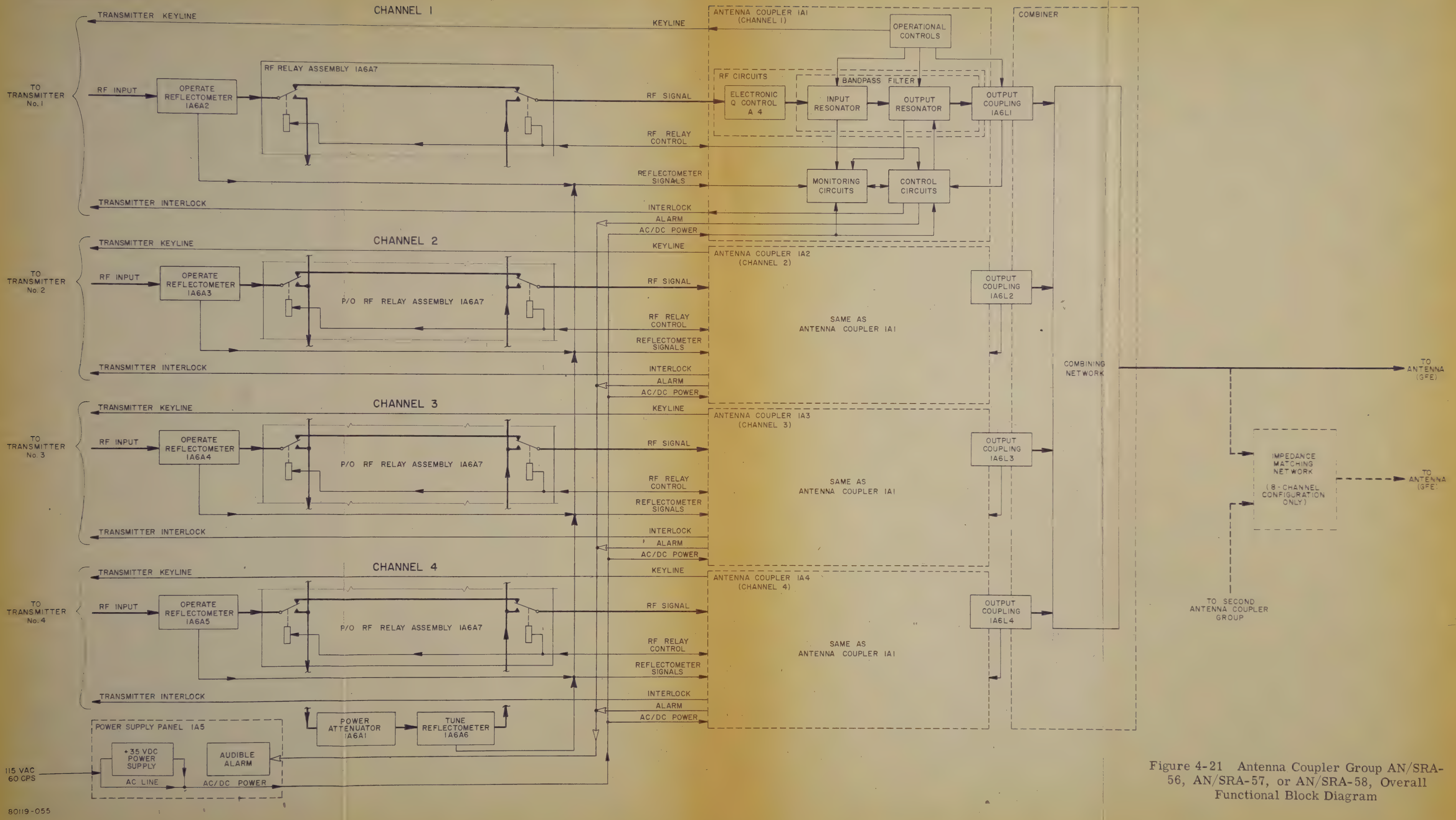

CHANNEL 1
TRANSMITTER KEYLINE
TO TRANSMITTER No. 1
RF INPUT
OPERATE REFLECTOMETER 1A6A2
RF RELAY ASSEMBLY 1A6A7
TRANSMITTER INTERLOCK
KEYLINE
RF SIGNAL
RF RELAY CONTROL
REFLECTOMETER SIGNALS
INTERLOCK
ALARM
AC/DC POWER
ANTENNA COUPLER 1A1 (CHANNEL 1)
OPERATIONAL CONTROLS
RF CIRCUITS
BANDPASS FILTER
ELECTRONIC Q CONTROL A 4
INPUT RESONATOR
OUTPUT RESONATOR
OUTPUT COUPLING 1A6L1
MONITORING CIRCUITS
CONTROL CIRCUITS
COMBINER
CHANNEL 2
TRANSMITTER KEYLINE
TO TRANSMITTER No. 2
RF INPUT
OPERATE REFLECTOMETER 1A6A3
P/O RF RELAY ASSEMBLY 1A6A7
TRANSMITTER INTERLOCK
KEYLINE
RF SIGNAL
RF RELAY CONTROL
REFLECTOMETER SIGNALS
INTERLOCK
ALARM
AC/DC POWER
ANTENNA COUPLER 1A2 (CHANNEL 2)
SAME AS ANTENNA COUPLER 1A1
OUTPUT COUPLING 1A6L2
COMBINING NETWORK
TO ANTENNA (GFE)
CHANNEL 3
TRANSMITTER KEYLINE
TO TRANSMITTER No. 3
RF INPUT
OPERATE REFLECTOMETER 1A6A4
P/O RF RELAY ASSEMBLY 1A6A7
TRANSMITTER INTERLOCK
KEYLINE
RF SIGNAL
RF RELAY CONTROL
REFLECTOMETER SIGNALS
INTERLOCK
ALARM
AC/DC POWER
ANTENNA COUPLER 1A3 (CHANNEL 3)
SAME AS ANTENNA COUPLER 1A1
OUTPUT COUPLING 1A6L3
IMPEDANCE MATCHING NETWORK (8-CHANNEL CONFIGURATION ONLY)
TO ANTENNA (GFE)
CHANNEL 4
TRANSMITTER KEYLINE
TO TRANSMITTER No. 4
RF INPUT
OPERATE REFLECTOMETER 1A6A5
P/O RF RELAY ASSEMBLY 1A6A7
TRANSMITTER INTERLOCK
KEYLINE
RF SIGNAL
RF RELAY CONTROL
REFLECTOMETER SIGNALS
INTERLOCK
ALARM
AC/DC POWER
ANTENNA COUPLER 1A4 (CHANNEL 4)
SAME AS ANTENNA COUPLER 1A1
OUTPUT COUPLING 1A6L4
TO SECOND ANTENNA COUPLER GROUP
POWER SUPPLY PANEL 1A5
+35 VDC POWER SUPPLY
AUDIBLE ALARM
AC LINE
AC/DC POWER
115 VAC 60 CPS
POWER ATTENUATOR 1A6A1
TUNE REFLECTOMETER 1A6A6
80119-055

Figure 4-21 Antenna Coupler Group AN/SRA-56, AN/SRA-57, or AN/SRA-58, Overall Functional Block Diagram

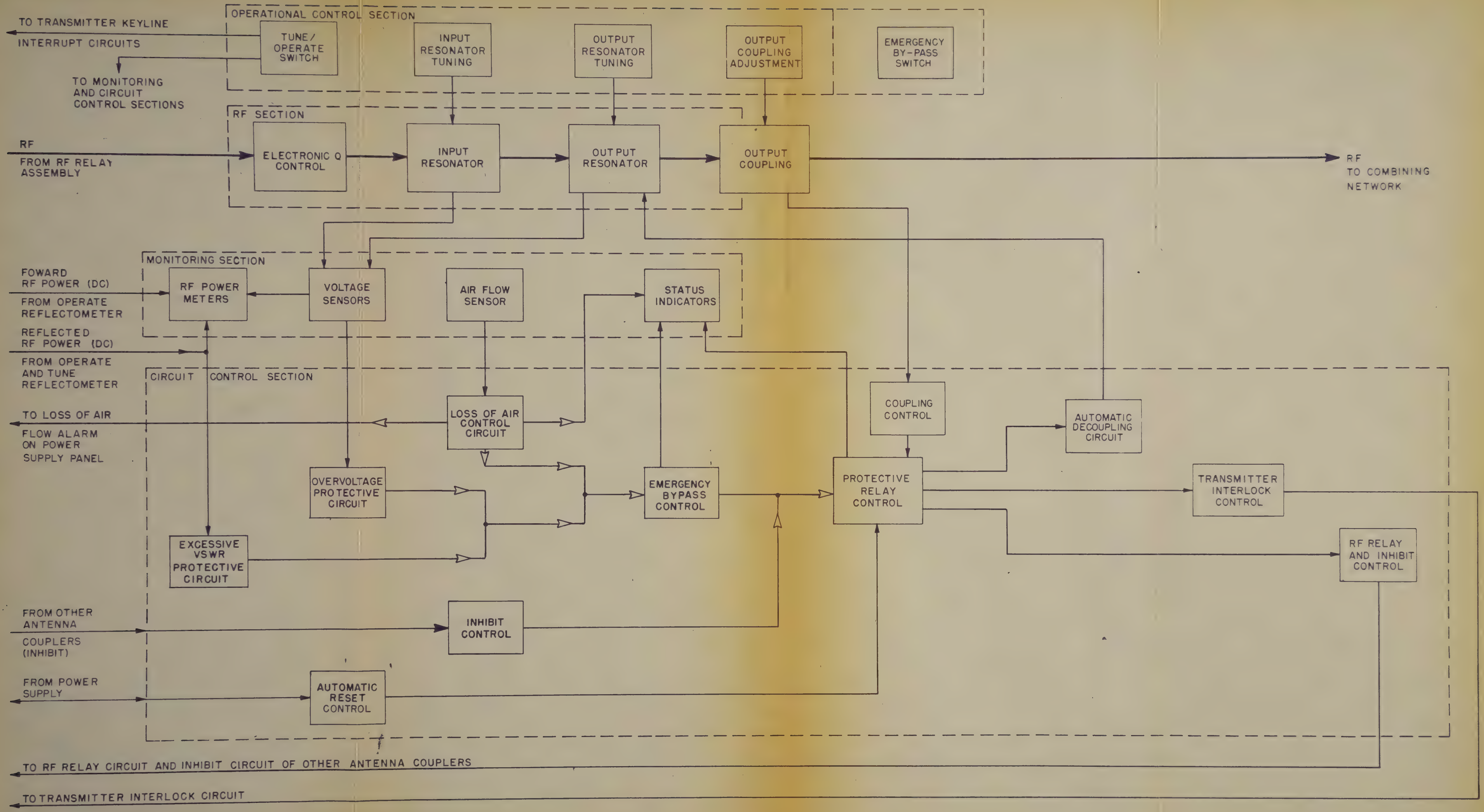

OPERATIONAL CONTROL SECTION
TO TRANSMITTER KEYLINE
INTERRUPT CIRCUITS
TUNE/ OPERATE SWITCH
INPUT RESONATOR TUNING
OUTPUT RESONATOR TUNING
OUTPUT COUPLING ADJUSTMENT
EMERGENCY BY-PASS SWITCH
TO MONITORING AND CIRCUIT CONTROL SECTIONS
RF SECTION
RF
FROM RF RELAY ASSEMBLY
ELECTRONIC Q CONTROL
INPUT RESONATOR
OUTPUT RESONATOR
OUTPUT COUPLING
RF
TO COMBINING NETWORK
MONITORING SECTION
FOWARD RF POWER (DC)
FROM OPERATE REFLECTOMETER
RF POWER METERS
VOLTAGE SENSORS
AIR FLOW SENSOR
STATUS INDICATORS
REFLECTED RF POWER (DC)
FROM OPERATE AND TUNE REFLECTOMETER
CIRCUIT CONTROL SECTION
TO LOSS OF AIR
FLOW ALARM ON POWER SUPPLY PANEL
LOSS OF AIR CONTROL CIRCUIT
COUPLING CONTROL
AUTOMATIC DECOUPLING CIRCUIT
OVERVOLTAGE PROTECTIVE CIRCUIT
EMERGENCY BYPASS CONTROL
PROTECTIVE RELAY CONTROL
TRANSMITTER INTERLOCK CONTROL
EXCESSIVE VSWR PROTECTIVE CIRCUIT
RF RELAY AND INHIBIT CONTROL
FROM OTHER ANTENNA COUPLERS (INHIBIT)
INHIBIT CONTROL
FROM POWER SUPPLY
AUTOMATIC RESET CONTROL
TO RF RELAY CIRCUIT AND INHIBIT CIRCUIT OF OTHER ANTENNA COUPLERS
TO TRANSMITTER INTERLOCK CIRCUIT
80119-060

Figure 4-22 Antenna Coupler CU-1772/SRA-56 CU-1774/SRA-56, or CU-1776/SRA-58, Functional Block Diagram

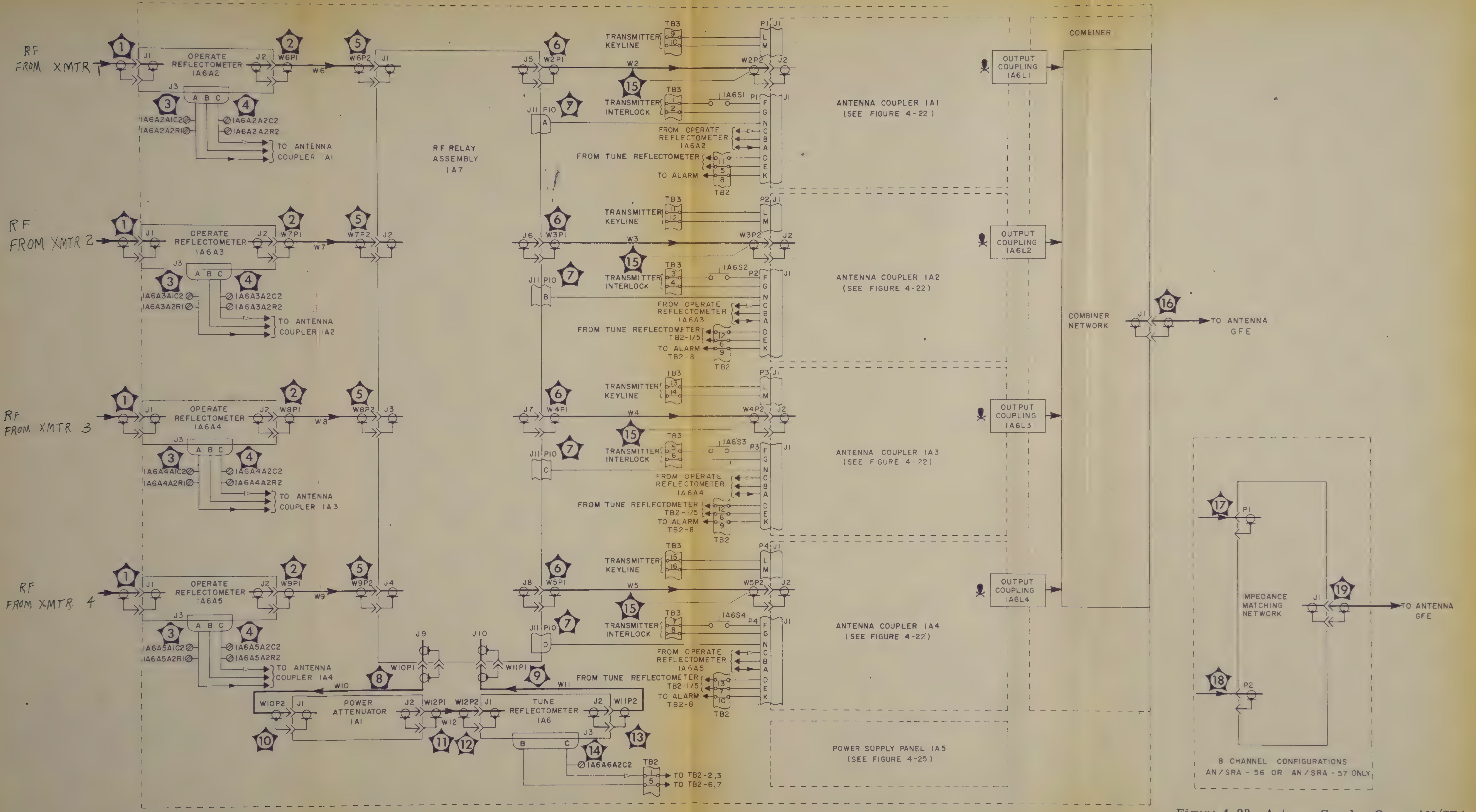

RF FROM XMTR 1
RF FROM XMTR 2
RF FROM XMTR 3
RF FROM XMTR 4
OPERATE REFLECTOMETER 1A6A2
OPERATE REFLECTOMETER 1A6A3
OPERATE REFLECTOMETER 1A6A4
OPERATE REFLECTOMETER 1A6A5
J1
J2
J3
A B C
W6P1
W6
W6P2
W7P1
W7
W7P2
W8P1
W8
W8P2
W9P1
W9
W9P2
1A6A2A1C2
1A6A2A2R1
1A6A2A2C2
1A6A2A2R2
TO ANTENNA COUPLER 1A1
1A6A3A1C2
1A6A3A2R1
1A6A3A2C2
1A6A3A2R2
TO ANTENNA COUPLER 1A2
1A6A4A1C2
1A6A4A2R1
1A6A4A2C2
1A6A4A2R2
TO ANTENNA COUPLER 1A3
1A6A5A1C2
1A6A5A2R1
1A6A5A2C2
1A6A5A2R2
TO ANTENNA COUPLER 1A4
RF RELAY ASSEMBLY 1A7
J4
J5
J6
J7
J8
J9
J10
J11
P10
W2P1
W2
W2P2
W3P1
W3
W3P2
W4P1
W4
W4P2
W5P1
W5
W5P2
TB3
TRANSMITTER KEYLINE
TRANSMITTER INTERLOCK
1A6S1
1A6S2
1A6S3
1A6S4
P1
P2
P3
P4
L
M
F
G
N
C
B
A
D
E
K
FROM OPERATE REFLECTOMETER 1A6A2
FROM OPERATE REFLECTOMETER 1A6A3
FROM OPERATE REFLECTOMETER 1A6A4
FROM OPERATE REFLECTOMETER 1A6A5
FROM TUNE REFLECTOMETER
TO ALARM
TB2
TB2-1/5
TB2-8
ANTENNA COUPLER 1A1 (SEE FIGURE 4-22)
ANTENNA COUPLER 1A2 (SEE FIGURE 4-22)
ANTENNA COUPLER 1A3 (SEE FIGURE 4-22)
ANTENNA COUPLER 1A4 (SEE FIGURE 4-22)
W10P1
W10
W10P2
W11P1
W11
W11P2
W12P1
W12
W12P2
POWER ATTENUATOR 1A1
TUNE REFLECTOMETER 1A6
B C
1A6A6A2C2
TO TB2-2,3
TO TB2-6,7
POWER SUPPLY PANEL 1A5 (SEE FIGURE 4-25)
COMBINER
OUTPUT COUPLING 1A6L1
OUTPUT COUPLING 1A6L2
OUTPUT COUPLING 1A6L3
OUTPUT COUPLING 1A6L4
COMBINER NETWORK
TO ANTENNA GFE
IMPEDANCE MATCHING NETWORK
8 CHANNEL CONFIGURATIONS AN/SRA-56 OR AN/SRA-57 ONLY
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
80119-076

Figure 4-23 Antenna Coupler Group AN/SRA-56, AN/SRA-57, or AN/SRA-58. Servicing Block Diagram

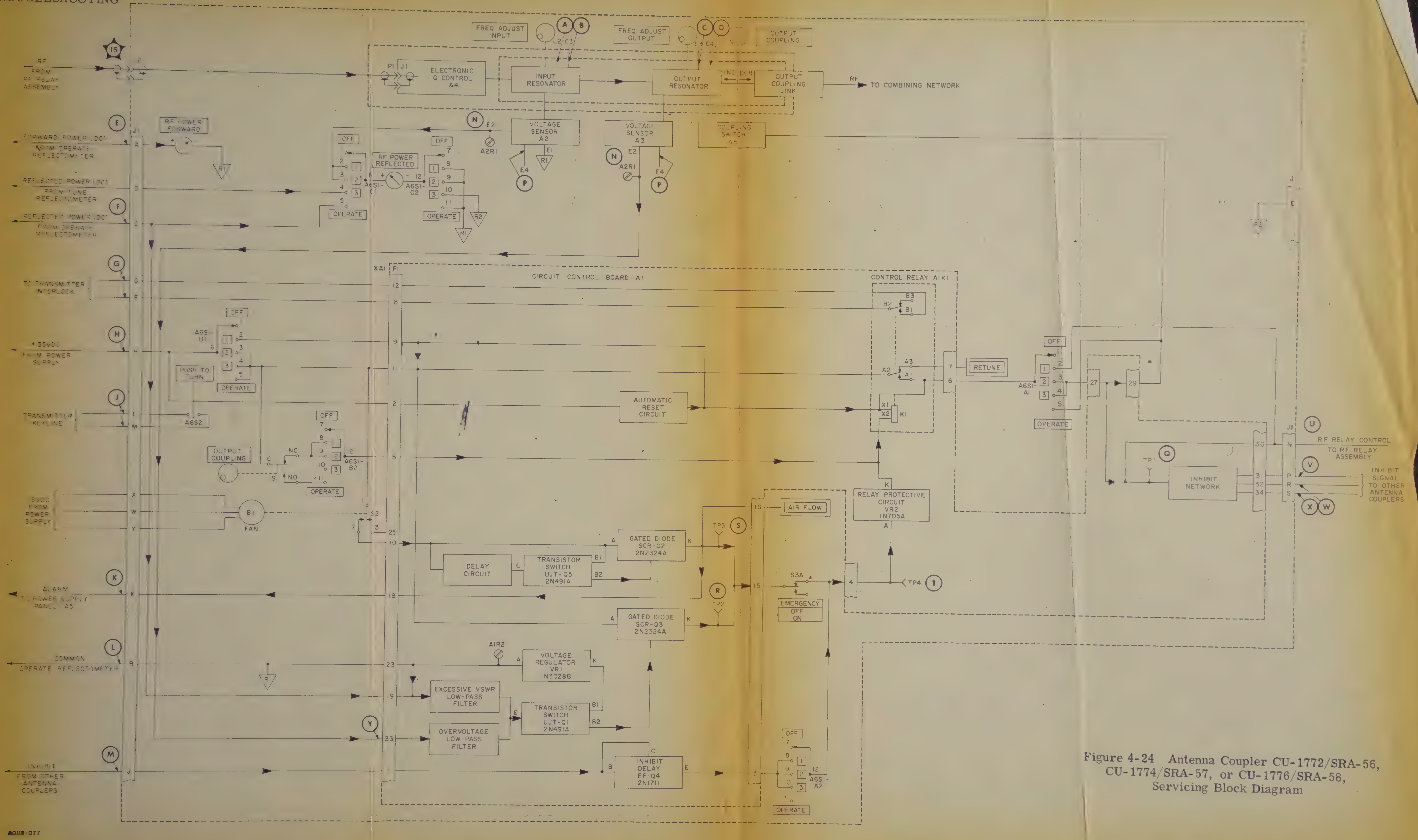

15
RF FROM RF RELAY ASSEMBLY
J2
FREQ ADJUST INPUT
A
B
L2
C3
FREQ ADJUST OUTPUT
C
D
L3
C4
OUTPUT COUPLING
P1
J1
ELECTRONIC Q CONTROL A4
INPUT RESONATOR
OUTPUT RESONATOR
INC
DCR
OUTPUT COUPLING LINK
RF
TO COMBINING NETWORK
E
RF POWER FORWARD
FORWARD POWER (DC) FROM OPERATE REFLECTOMETER
J1
A
R1
REFLECTED POWER (DC) FROM TUNE REFLECTOMETER
D
F
REFLECTED POWER (DC) FROM OPERATE REFLECTOMETER
C
OFF
RF POWER REFLECTED
A6S1-C1
A6S1-C2
OPERATE
OPERATE
R2
R1
N
E2
A2R1
VOLTAGE SENSOR A2
E1
R1
E4
P
VOLTAGE SENSOR A3
N
E2
A2R1
E4
P
COUPLING SWITCH A5
G
TO TRANSMITTER INTERLOCK
G
F
XA1
P1
CIRCUIT CONTROL BOARD A1
CONTROL RELAY A1K1
B3
B2
B1
H
+35VDC FROM POWER SUPPLY
H
A6S1-B1
OFF
PUSH TO TURN
OPERATE
A3
A2
A1
X1
X2
K1
RETUNE
A6S1-A1
OFF
OPERATE
27
29
J
TRANSMITTER KEYLINE
L
M
A6S2
AUTOMATIC RESET CIRCUIT
OUTPUT COUPLING
C
NC
NO
S1
OFF
A6S1-B2
OPERATE
RELAY PROTECTIVE CIRCUIT VR2 1N705A
J1
U
RF RELAY CONTROL TO RF RELAY ASSEMBLY
Q
TP1
INHIBIT NETWORK
30
31
32
34
N
P
R
S
V
INHIBIT SIGNAL TO OTHER ANTENNA COUPLERS
X
W
5VDC FROM POWER SUPPLY
X
W
Y
B1
FAN
S2
AIR FLOW
TP3
S
GATED DIODE SCR-Q2 2N2324A
DELAY CIRCUIT
TRANSISTOR SWITCH UJT-Q5 2N491A
K
ALARM TO POWER SUPPLY PANEL A5
K
R
TP2
S3A
EMERGENCY OFF ON
TP4
T
GATED DIODE SCR-Q3 2N2324A
L
COMMON OPERATE REFLECTOMETER
B
R1
A1R21
VOLTAGE REGULATOR VR1 1N3028B
EXCESSIVE VSWR LOW-PASS FILTER
TRANSISTOR SWITCH UJT-Q1 2N491A
Y
OVERVOLTAGE LOW-PASS FILTER
M
INHIBIT FROM OTHER ANTENNA COUPLERS
J
INHIBIT DELAY EF-Q4 2N1711
OFF
A6S1-A2
OPERATE
8049-077

Figure 4-24 Antenna Coupler CU-1772/SRA-56, CU-1774/SRA-57, or CU-1776/SRA-58, Servicing Block Diagram

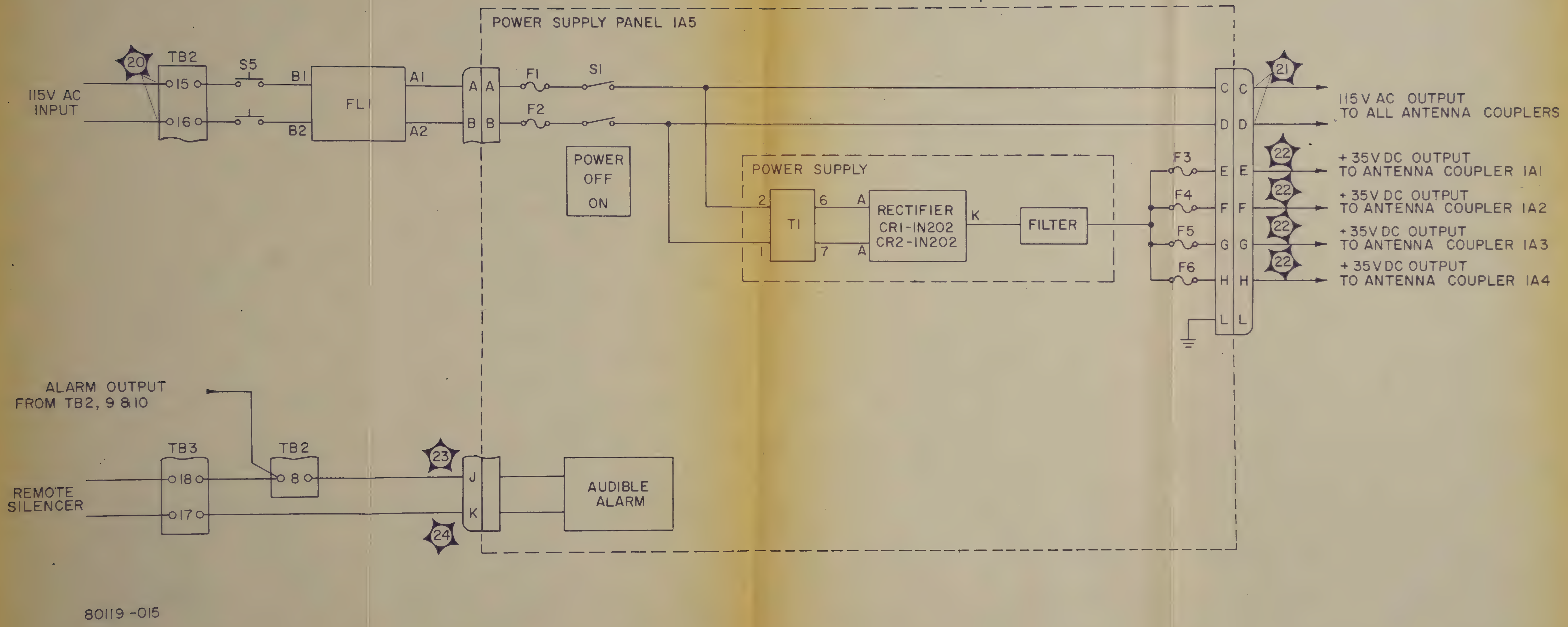

POWER SUPPLY PANEL IA5
20
TB2
15
16
S5
BI
B2
FL I
AI
A2
115V AC
INPUT
A
B
FI
F2
SI
POWER
OFF
ON
POWER SUPPLY
2
1
TI
6
7
A
A
RECTIFIER
CRI-IN202
CR2-IN202
K
FILTER
F3
F4
F5
F6
C
D
E
F
G
H
L
21
22
115 V AC OUTPUT
TO ALL ANTENNA COUPLERS
+ 35V DC OUTPUT
TO ANTENNA COUPLER IAI
+ 35V DC OUTPUT
TO ANTENNA COUPLER IA2
+ 35V DC OUTPUT
TO ANTENNA COUPLER IA3
+ 35V DC OUTPUT
TO ANTENNA COUPLER IA4
ALARM OUTPUT
FROM TB2, 9 & 10
TB3
18
17
TB2
8
REMOTE
SILENCER
23
24
J
K
AUDIBLE
ALARM
80119 -015

Figure 4-25 Power Supply PP-4993/SRA,
Servicing Block Diagram

SECTION 5

MAINTENANCE

5.1 FAILURE, AND PERFORMANCE AND OPERATIONAL REPORTS

Note

> The Naval Ship Systems Command does not require the submission of failure reports for all equipments. Failure Reports, and Performance and Operational Reports are to be accomplished for designated equipments (refer to Electronics Installation and Maintenance Book, NAVSHIPS 0967-000-0000) only to the extent required by existing directives. Report all failures for those equipments that do require the use of Failure Reports.

5.2 PREVENTIVE MAINTENANCE

The preventive maintenance required for Antenna Coupler Groups AN/SRA-56, AN/SRA-57, and AN/SRA-58 consists of visual and mechanical inspections, quick checks of rf and control circuits, measurement of certain operational parameters, and alignment and adjustment of critical items. These procedures will ensure that the coupler groups operate with optimum performance and that minor troubles can be corrected before they become major troubles.

5.2.1 Maintenance Standards

No historical data exists on these coupler groups. Therefore, it is necessary to establish standards in the form of statistical data against which the performance of the coupler groups can be compared. The initial standards should be determined at installation and continued throughout the life of the equipment as required by the reference standards porcedures.

It is important to keep in mind that, in such a collection of statistical data, individual measurements have little meaning in themselves and will vary slightly from measurement to measurement depending upon the individual technician taking the measurement, and the conditions under which the measurements were obtained. In general, only steady trends showing degradation of performance or large, sudden jumps in the data are significant, and these must be investigated carefully. However, in these cases, it is wise to repeat the measurement before attempting to take corrective action.

The preventive maintenance, alignment,and adjustment procedures are designed to progress from the simpler to the more difficult. Follow these procedures carefully and, where possible, in the order given. To minimize the time and effort required in these procedures, do not go beyond any procedure that positively identifies the trouble.

5.2.1.1 Test Equipment

The test equipment required for the preventive maintenance procedures is summarized in table 5-1. Equivalent test equipment may be substituted for any item in the table provided such test equipment has characteristics identical to the specific item as used in the individual procedure.

5.2.1.2 Special Test Cables and Test Set

One special control cable and test set is required to calibrate the antenna coupler control system. Special rf cables for each coupler group are required to measure the performance of the

TABLE 5-1. TEST EQUIPMENT FOR PREVENTIVE MAINTENANCE PROCEDURES

EQUIPMENT	TYPE	REL INSERTION LOSS	WORST CASE LOAD	CONTROL SYSTEM CAL.	DETAIL INSERTION LOSS	ISOLATION
Transmitter, 1 kw	On Board 2-30 mc	1	1		1	1
Multimeter	AN/PSM-4D			1		
Electronic Voltmeter	AN/URM-155				2	2
Variable Attenuator	CN-796/U				2	1
Digital Electronic Counter	CP-772/U				1	1
Electrical Dummy Load	DA-242/U	1	3	1	1	1
Signal Generator	SG-582/U				1	1
Multimeter	ME-303/U	1			1	
RF Wattmeter	Sierra 164-FNM		1			
Plug-in element for RF wattmeter	Sierra 270A-30		1			
Digital Voltmeter	Digitec 202			1		
Termination, 50-ohm	Microlab/FRX TA-5MN					1
Probe Coaxial "T" Adaptor	HP-11042A	2			2	
Variable Attenuator	Telonic TC-50A				1	
Coaxial Switch	Bird 72A				2	
Resistor, 1K	Fixed, Shielded				1	1
Control System Cable & Test Set	Special			1		
RF Test Cables	Special			2		
RF Cables & Adaptors		As req	As req		As req	As req

coupler group under the worst case, 3-to-1 vswr load condition.

5.2.1.2.1 Control System Cable and Test Set

The control system cable and test set is used in the calibration of the control circuits in each antenna coupler. The same cable and test set is used for all antenna couplers in all three coupler groups. A schematic diagram and fabrication details of the control system cable and test set are given in figure 5-1. The calibration procedures it is used with are given in paragraph 5.2.1.5.4.

5.2.1.2.2 Special RF Cables

Special rf cables for each coupler group are used in the measurement of antenna coupler performance under worst case, 3-to-1 vswr load condition. One standard cable, 20 feet in length, is used to establish a reference or control point on the 3-to-1 vswr circle at the worst case frequency, while the second cable is used to present the worst case matching condition to the antenna coupler for the 3-to-1 vswr load. Two special cables are required for each coupler group; an additional special cable is required for 8 channel configurations of Antenna Coupler Group AN/SRA-57. Schematic diagrams and fabrication details for these cables are shown in figure 5-2. The procedures with which they are used are presented in paragraph 5.2.1.5.3.

5.2.1.3 Special Procedures

In the procedures that follow, the entire coupler group should be secured in accordance with paragraph 3.3.2.5 of the Operator's Handbook. However, when maintenance cannot be scheduled to permit all channels to be secured because of operational requirements, it is possible to perform some of the inspections, checks, and measurement procedures that involve only one antenna coupler at a time. Traffic can then be shifted to a channel that has been checked, and the procedures repeated for other channels in the coupler group.

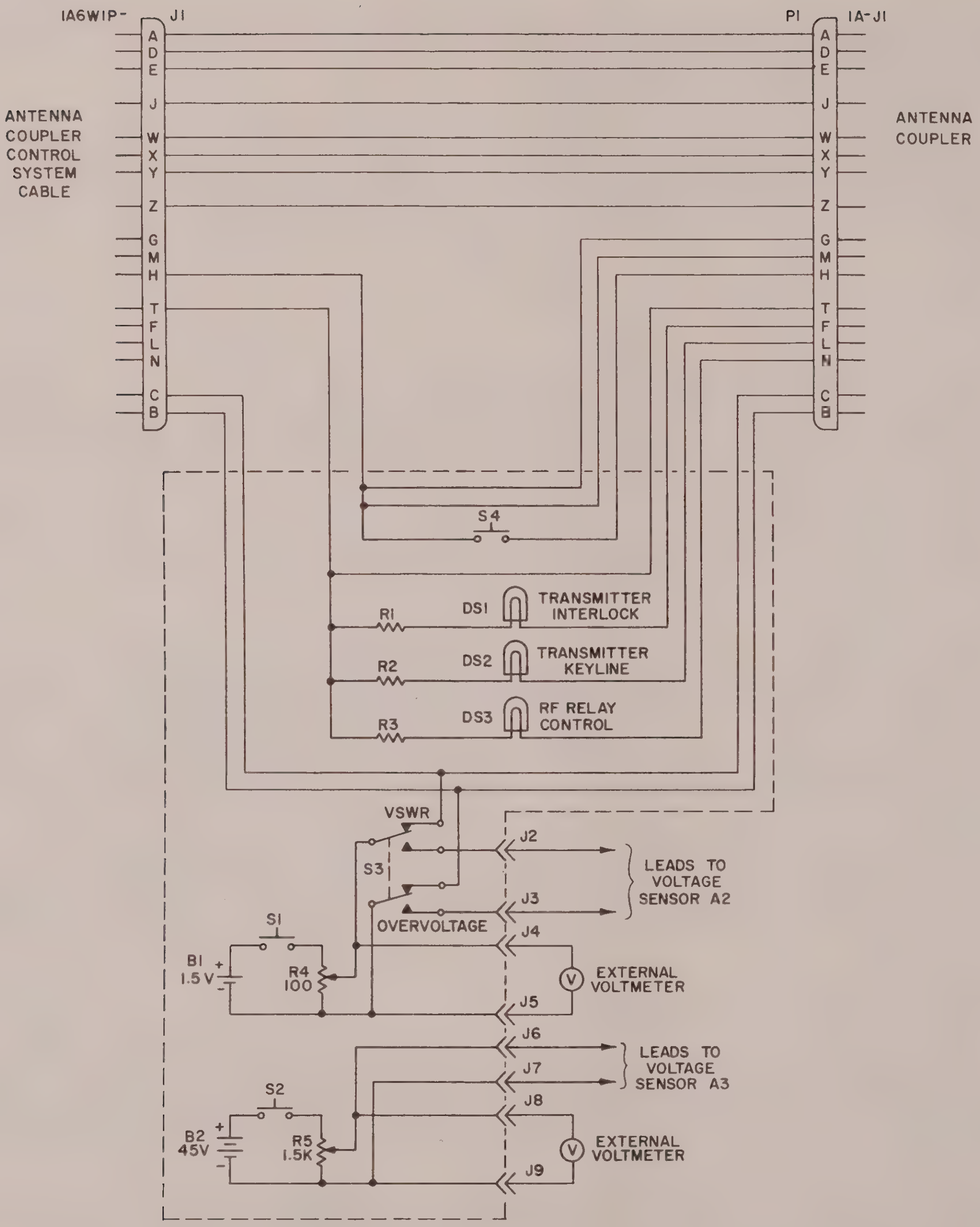
The entire coupler group must be secured for the inhibit control circuit check (paragraph 5.2.1.5.1.3); worst case, 3-to-1 vswr load (paragraph 5.2.1.5.3), relative and detailed insertion loss measurements (paragraphs 5.2.1.5.2 and 5.2.1.5.5), and isolation measurements (paragraph 5.2.1.5.6).

5.2.1.4 Reference Standards Procedures

The reference standards procedures for Antenna Coupler Groups AN/SRA-56, -57, and -58 are presented in table 5-2. These procedures must be performed in accordance with instructions given in paragraph 5.2.1.5. The following paragraphs will aid in interpreting the data obtained for the reference standards procedures.

Although the antenna couplers are completely interchangeable and can occupy any position in the equipment cabinet, the OUTPUT COUPLING indicator characteristics of an individual antenna coupler are dependent upon the position in which the antenna coupler is installed. For repeatability of the OUTPUT COUPLING number, it is important to maintain a daily record of the particular antenna coupler installed in a particular position of the cabinet. Changes in the OUTPUT COUPLING number can be expected when a drawer is placed in a position other than that in which previous data was taken. When an antenna coupler position is changed, the previous data on that antenna coupler is invalid, and a new history from which to interpret the data must be compiled.

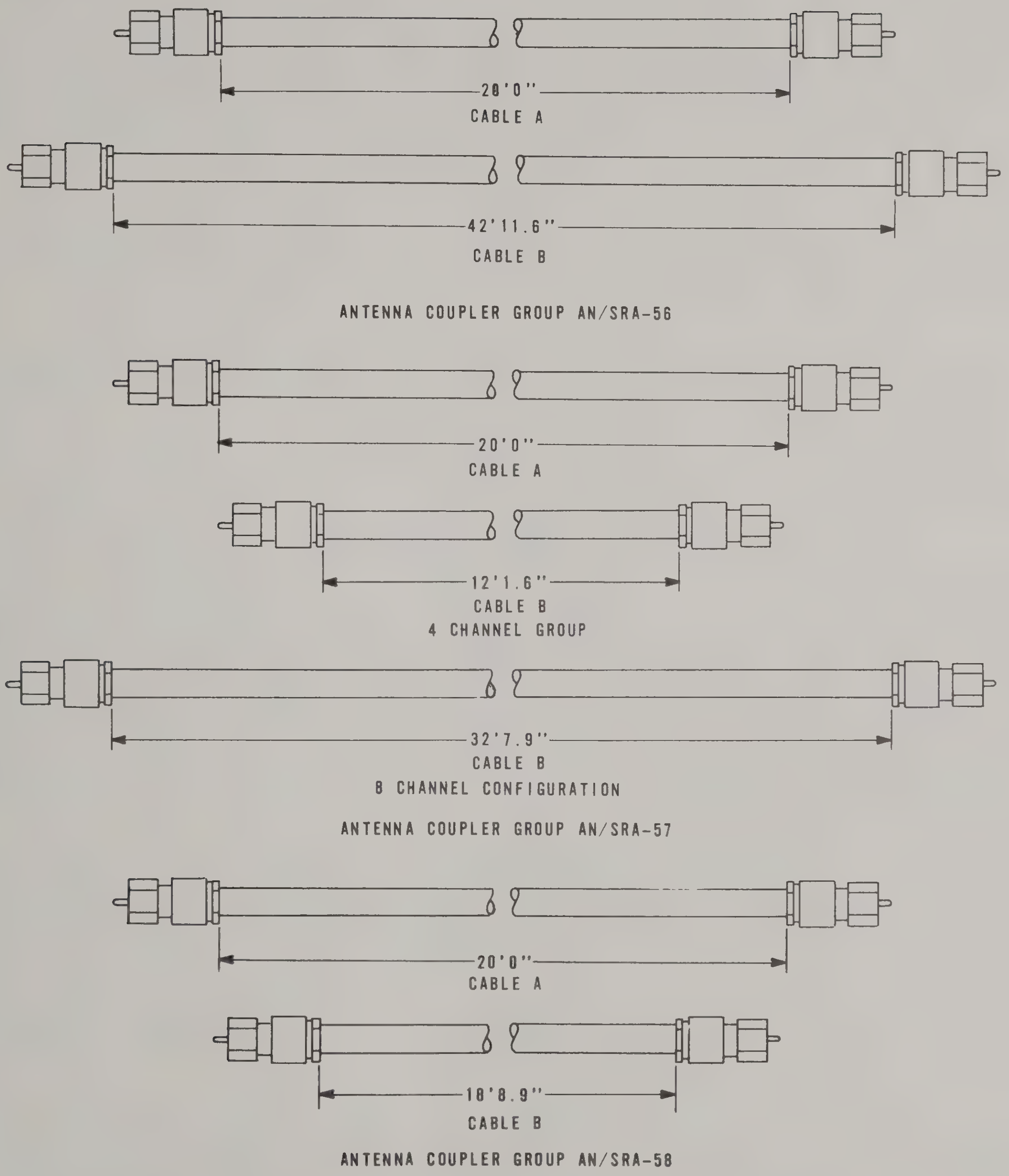
Record OUTPUT COUPLING number information that lends itself to interpretation meaningfully. The more entries related to the same frequency on continuing days that are made, the more valuable the recorded data becomes in showing trends that will disclose deterioration of


IA6WIP-
J1
P1
IA-J1
ANTENNA COUPLER CONTROL SYSTEM CABLE
ANTENNA COUPLER
A
D
E
J
W
X
Y
Z
G
M
H
T
F
L
N
C
B
S4
R1
DS1
TRANSMITTER INTERLOCK
R2
DS2
TRANSMITTER KEYLINE
R3
DS3
RF RELAY CONTROL
VSWR
S3
OVERVOLTAGE
J2
J3
LEADS TO VOLTAGE SENSOR A2
J4
EXTERNAL VOLTMETER
V
J5
S1
B1 1.5V
R4 100
J6
J7
LEADS TO VOLTAGE SENSOR A3
J8
S2
B2 45V
R5 1.5K
EXTERNAL VOLTMETER
J9

80119-081

B1	BATTERY, DRYCELL (SIZE C)	EVEREADY 1150 OR EQUIVALENT
	HOLDER, BATTERY	KEYSTONE 175
B2	BATTERY, ZINC-CARBON "B"	BURGESS 30PI
	PLUG, BATTERY	CINCH JONES 5BIA
DS1 THRU DS3	LAMP, 28 VOLTS, 0.040 AMP	G.E. 1819
	LAMP HOLDER, T 3 1/4 LAMP	DIALCO SERIES 95-9110-0935-102
P1	CONNECTOR, PLUG	MS 3116 F16-26P
J1	CONNECTOR, RECEPTACLE	MS 3116 F16-26S
R1 THRU R3	RESISTOR, 330 OHM, 1 W, 10% CARBON	
R4	POTENTIOMETER, 100 OHM,10%, W.W.,2 WATT	IRC RA20-100 OR EQUIVALENT
R5	POTENIOMETER, 15 OHM,10%, W.W, 2 WATT	IRC RA20-14K OR EQUIVALENT
S1,S2	SWITCH, SPST, N.O.	SWITCHCRAFT 1001 OR EQUIVALENT
S3	SWITCH, TOGGLE, DPDT	CUTLER HAMMER 7591KG OR EQUIVALENT
S4	SWITCH, SPST, N.C.	SWITCHCRAFT 1002 OR EQUIVALENT

Figure 5-1 Control System Cable and Test Set


20'0"
CABLE A
42'11.6"
CABLE B
ANTENNA COUPLER GROUP AN/SRA-56
20'0"
CABLE A
12'1.6"
CABLE B
4 CHANNEL GROUP
32'7.9"
CABLE B
8 CHANNEL CONFIGURATION
ANTENNA COUPLER GROUP AN/SRA-57
20'0"
CABLE A
18'8.9"
CABLE B
ANTENNA COUPLER GROUP AN/SRA-58

80119-082

NOTES:

1. CONNECTOR AT EQUIPMENT END OF CABLE IS UG-1185A/U.
2. CONNECTOR AT OTHER END AS REQUIRED BY DUMMY LOADS.
3. FOR 8 CHANNEL CONFIGURATIONS USE ADAPTERS UG/909A/U AND ANDREWS 2361.
4. FOR 4 CHANNEL GROUPS USE ADAPTER UG-909A/U

Figure 5-2 RF Test Cables

equipment performance. During operation, try to use the same antenna coupler on the same circuit where possible.

In the daily log, a comment column should be added to enter unusual weather conditions that might cause the OUTPUT COUPLING numbers to change due to the resulting changes in antenna characteristics. Use this column to note briefly any other unusual items pertaining to the antenna coupler, such as drop outs, equipment removed for service, etc.

For all monthly data, check the installed position of the individual antenna couplers with that of the reference standard data measured at the time of installation (see paragraph 2.4.3.3). The data from antenna couplers whose positions have not been changed can be compared directly and should be reviewed for the following:

a. More than 2 Percent Change in FREQ ADJUST INPUT or FREQ ADJUST OUTPUT Tape Indicators. If the frequency indicator shows a change at both the high and low frequency points, yet there is no change in the OUTPUT COUPLING numbers or relative insertion loss, the tape probably has slipped on its drive, or the alignment of the insulating drive shaft to a capacitor is faulty. If the change is accompanied by a change in OUTPUT COUPLING number and in the relative insertion loss, the Q of one of the capacitors is probably deteriorating.

b. Change in OUTPUT COUPLING Control Indicator Number Only. If the change is small, it may be due to the tuning technique employed by different operators. After a series of checks have been made, evaluate the normal range spread due to tuning technique. For consistency in taking test data readings, always make the final adjustment during the tuning of the OUTPUT COUPLING control by turning the control in the same direction each time, even if this requires that the control be operated in the reverse direction past the proper point and then in the proper direction to approach the point. A change in OUTPUT COUPLING number will probably be accompanied by a change in the relative insertion loss, if the load remains constant. When such a noted change is small, flag it for close scrutiny during subsequent test periods. If it is large and the accompanying relative insertion loss change is greater than 0.5 db, pull the antenna coupler for servicing at the first opportunity.

c. Change in OUTPUT COUPLING Number and Relative Insertion Loss. A change in both OUTPUT COUPLING number and relative insertion loss in more than one antenna coupler may be indicative of some change within the ouput link coupling assembly. If possible, temporarily interchange the unit whose characteristics have changed with a unit in a cabinet position in which conditions are normal. If the antenna coupler when installed in the position giving normal readings gives a normal relative insertion loss (OUTPUT COUPLING number will change with relation to position within a cabinet), the trouble is probably outside of the antenna coupler; if the insertion loss remains high, the trouble is probably within the antenna coupler.

d. Changes in All Antenna Couplers. A change in OUTPUT COUPLING numbers and relative insertion loss figures of all antenna couplers within a cabinet or two-cabinet, 8 channel configuration may be indicative of a problem within the combiner of a single group or the impedance matching network of an 8-channel configuration. However, before performing further checks, ensure that the characteristics of the electrical dummy load have not changed. A quick precision resistance measurement should be sufficient. Replace the load if a precisely measured resistance value of the load differs more than 1 ohm from the nominal impedance value stamped on the nameplate, or from its previously recorded value.

Antenna couplers that are not installed in their original cabinet positions must not have their OUTPUT COUPLING numbers compared with previous data, but the relative insertion loss data can be compared with prior data of the same antenna coupler.

After a few reference standards procedures have been accomplished, the expected variations due to operator tuning technique will become apparent. Entires will then lend themselves to interpretation for evaluating long-term trends that will flag the need for further investigation. Significant changes should be investigated or evaluated immediately, but it is not possible to place absolute limits that require removal and bench testing of the equipment.

Note

The procedures listed in table 5-2 consist of the minimum number of reference standards which will indicate, when completed, the relative performance of each antenna coupler. The procedures are listed in the suggested sequence of performance; however, deviations from the listed order will in no way affect the unity or results of the reference standards, unless otherwise noted.

TABLE 5-2. REFERENCE STANDARDS PROCEDURES

SECTION	ACTION REQUIRED	PERIOD
Associated Transmitters	Record operating frequency and output power	D1
EACH ANTENNA COUPLER		
Monitoring	Record RF POWER FORWARD meter indication	D2
Monitoring	Record RF POWER REFLECTED meter indication	D3
Operational Controls	Record FREQ ADJUST INPUT indicator setting	D4
Operational Controls	Record FREQ ADJUST OUTPUT indicator setting	D5
Operational Controls	Record OUTPUT COUPLING indicator setting	D6
RF Circuits	Measure and record relative insertion loss	M1
RF Circuits	Measure and record worst case, 3-to-1 vswr load performance	S1
RF Circuits	Measure and record detailed insertion loss	U1
EACH COUPLER GROUP		
Antenna Couplers	Measure and record isolation between channels	U2

5.2.1.5 Preventive Maintenance Procedures

The preventive maintenance procedures for the antenna coupler groups are presented in the maintenance schedule in table 5-3. Most of these procedures consist primarily of simple visual inspections and minor adjustments. However, these procedures are important, and must be followed carefully. Detailed instructions for performing more complex checks and measurements are contained in the remaining paragraphs of this subsection.

WARNING

Do not permit any one to service the equipment alone, and do not permit any personnel or equipment to come in contact with any output link while a transmitter is operating through the coupler group. These output links contain extremely high rf voltages that may be fatal if contacted.

TABLE 5-3. MAINTENANCE SCHEDULE

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS AND REMEDIES
DAILY		
RF POWER FORWARD meter	Compare meter indication with transmitter output level	Check transmitter for drift. Troubleshoot antenna coupler if indication exceeds ±5% of transmitter power.
RF POWER REFLECTED meter	Compare meter indication with previous indications at same frequency and antenna	Trim or retune antenna coupler. Troubleshoot antenna coupler if reflected power exceeds 20 watts
FREQ ADJUST INPUT indicator	Compare indicator setting with transmitter frequency	Troubleshoot antenna coupler if setting exceeds ±2% of operating frequency.
FREQ ADJUST OUTPUT indicator	Compare indicator with antenna coupler in TUNE-2 to the transmitter operating frequency	Troubleshoot antenna coupler if setting exceeds ±2% of operating frequency.
OUTPUT COUPLING indicator	Compare indicator setting with previous setting at same frequency, antenna, and cabinet position	If required, measure relative insertion loss. Troubleshoot antenna coupler if insertion loss value differs by 0. 5 db.
MONTHLY		
Air Filter	Check for accumulation of dirt	Wash thoroughly with soap and water. Apply 2 fl. oz. of oil, (MIL-L-15016), spread with lintless cloth and allow to drain for 8 hours.
Control System	Perform check of control system operation (paragraph 5. 2. 1. 5. 1)	Troubleshoot antenna coupler control system if check fails.
RF Circuits	Perform relative insertion loss measurement procedures in paragraph 5. 2. 1. 5. 2	Troubleshoot antenna coupler if insertion loss is not acceptable. See paragraph 5. 2. 1. 4, reference standards procedures.
SEMIANNUALLY		
Accumulation of dust, dirt, and corrosion in all antenna couplers and coupler group	Check for deposits of dust, dirt and corrosion, particularly on porcelain and glass of vacuum capacitors	Remove by approved methods.
All nut, bolt, and screw connections in all antenna couplers and coupler group	Check for corrosion, looseness, or poor contacts	Scrape clean, and tighten as required.
All connectors and cables in all antenna couplers and coupler group	Check for looseness, wear, and damage	Tighten connectors, and repair or replace connectors or cables as required.

TABLE 5-3. MAINTENANCE SCHEDULE (Continued)

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS AND REMEDIES
SEMIANNUALLY (Continued)		
All coils, capacitors, and insulators in all antenna couplers	Visually and manually inspect all components for damage	Repair or replace components showing signs of breakdown or damage.
Combiner link stream assembly	Check conductors for cracks and spacers for looseness	Repair or replace damaged parts.
Output resonator decoupling solenoid and shorting arm	Check solenoid assembly for binding and shorting arm contact surfaces for dirt, dust, and corrosion	Mechanically adjust shorting arm and clean contact surfaces with alcohol as required.
Tuning capacitor spark gaps	Check for pitting and proper spacing	Burnish and polish pits. Adjust spacing as required. Check components in voltage sensor A3 for proper operation.
Tuning capacitor drive assemblies	Check for binding, looseness or other abnormal conditions	Repair or replace worn or damaged parts. Lubricate gears with lubricating grease MIL-G-21164.
Output coupling drive assembly	Check for binding, looseness or other abnormal conditions	Repair or replace worn or damaged parts.
Coupling link drive assembly	Check for binding, looseness or other abnormal conditions	Repair or replace worn or damaged parts. Lubricate screw shaft with lubricating grease MIL-G-21164.
Control system in all antenna couplers	Perform calibrations of control system (paragraph 5.2.1.5.4)	Troubleshoot control system if system cannot be calibrated as required.
Matching capability of antenna coupler	Perform worst case, 3-to-1 vswr load measurement procedure in paragraph 5.2.1.5.3	Troubleshoot antenna coupler if performance is not acceptable. See paragraph 5.2.1.4, reference standards procedures.
UNSCHEDULED		
Insertion Loss	Perform detailed insertion loss measurement procedures in paragraph 5.2.1.5.5	Perform only as required when other checks and measurements indicate trouble in the rf circuit.
Isolation between channels	Perform isolation measurement procedures in paragraph 5.2.1.5.6	Perform only as required when other checks and measurements indicate trouble in the rf circuit.

5.2.1.5.1 Control System Check

The following procedures check the overall operation of the control circuits within each antenna coupler in a coupler group. These procedures are accomplished using only the front panel controls and indicators. No test equipment or special tools are required.

Perform these procedures for each antenna coupler. Start the check with antenna coupler 1A1 and repeat the procedures for antenna couplers 1A2, 1A3, and 1A4 in that order. For an eight-channel configuration, repeat the entire procedure for the second antenna coupler group.

5.2.1.5.1.1 Loss-of-Air-Flow Control Circuit and EMERGENCY Switch Operation

The loss-of-air-flow control circuit check ensures that the antenna coupler will shut down if the air flow within the antenna coupler becomes inadequate. The EMERGENCY switch operation check ensures that a fault condition presented by the loss-of-air-flow, excessive vswr, or overvoltage protective circuits can be bypassed for emergency operation. Refer to paragraphs 4.3.5.3.4.6 and 4.3.5.3.4.7 for a description and simplified schematic diagram of these circuits.

Step 1. If possible, secure the complete coupler group in accordance with paragraph 3.3.2.5 of the Operator's Handbook. Ensure that the TUNE/OPERATE switch on the antenna coupler being checked is in the OFF position as an initial setting.

Step 2. On power supply panel 1A5, operate POWER-ON/OFF switch to ON. The air intake fan in each antenna coupler must run.

Step 3. On antenna coupler 1A1, rotate TUNE/OPERATE switch to TUNE-1. NORMAL indicator must light.

Step 4. Place a sheet of paper or cardboard over the air intake filter on the antenna coupler to block the air to the fan. AIR FLOW indicator must light, RETUNE indicator must light, NORMAL indicator must go out, and audible ALARM on power supply panel must sound.

Step 5. Operate EMERGENCY-ON/OFF switch to ON. NORMAL indicator must light, RETUNE indicator must go out, AIR FLOW indicator must remain lit, and audible ALARM must continue to sound.

Step 6. On the power supply panel, press ALARM SILENCER switch. Audible ALARM must cease, but AIR FLOW indicator on antenna coupler must remain lit.

Step 7. Operate EMERGENCY-ON/OFF switch to OFF. RETUNE indicator must light, NORMAL indicator must go out, and AIR FLOW indicator must remain lit.

Step 8. Remove paper or cardboard from the air intake filter. AIR FLOW indicator must go out, RETUNE indicator must go out, and NORMAL indicator must light.

Step 9. Rotate TUNE/OPERATE switch to OFF.

Step 10. On antenna coupler 1A2, rotate TUNE/OPERATE switch to TUNE-1 (NORMAL indicator must light), and repeat steps 4 through 9 for that antenna coupler.

Step 11. On antenna coupler 1A3, rotate TUNE/OPERATE switch to TUNE-1 (NORMAL indicator must light), and repeat steps 4 through 9 for that antenna coupler.

Step 12. On antenna coupler 1A4, rotate TUNE/OPERATE switch to TUNE-1 (NORMAL indicator must light), and repeat steps 4 through 9 for that antenna coupler.

5.2.1.5.1.2 Coupling Control, Tuning Sequence, and Automatic Reset Circuit

The coupling control circuit check ensures that the antenna coupler will shut down if the OUTPUT COUPLING control is not in the required position during tuning and operation. The tuning sequence check ensures that the antenna coupler operates normally when the proper steps are followed in the required order. The automatic reset check ensures that the antenna coupler will reset to its correct status when power is restored after a primary power failure. Refer to paragraphs 4.3.5.3.4.5 and 4.3.5.3.4.2 for descriptions and simplified schematic diagrams.

Step 1. On antenna coupler 1A1, ensure that the OUTPUT COUPLING control is in the maximum DECREASE direction to the stop.

Step 2. Rotate TUNE/OPERATE switch to TUNE-1. NORMAL indicator must light.

Step 3. Rotate OUTPUT COUPLING control two revolutions in the INCREASE direction. RETUNE indicator must light and NORMAL indicator must go out.

Step 4. Rotate TUNE/OPERATE switch to TUNE-2. RETUNE indicator must remain lit.

Step 5. Rotate OUTPUT COUPLING control in the DECREASE direction to the stop. RETUNE indicator must remain lit.

Step 6. Rotate TUNE/OPERATE switch to TUNE-1. NORMAL indicator must light and RETUNE indicator must go out.

Step 7. Rotate TUNE/OPERATE switch to TUNE-2. NORMAL indicator must remain lit.

Step 8. Rotate TUNE/OPERATE switch to TUNE-3. NORMAL indicator must remain lit.

Step 9. Rotate OUTPUT COUPLING two revolutions in the INCREASE direction. NORMAL indicator must remain lit.

Step 10. Depress and rotate TUNE/OPERATE switch to OPERATE. NORMAL indicator must remain lit.

Step 11. On power supply panel 1A5, operate POWER-ON/OFF switch to OFF; NORMAL indicator on antenna coupler must go out. After 15 seconds, operate POWER ON/OFF switch to ON; NORMAL indicator must light.

Step 12. On the antenna coupler, rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop. RETUNE indicator must light and NORMAL indicator must go out.

Step 13. On the power supply panel, operate POWER-ON/OFF switch to OFF; RETUNE indicator must go out. After 15 seconds, operate POWER-ON/OFF switch to ON; RETUNE indicator must light.

Step 14. Rotate TUNE/OPERATE switch to TUNE-2. RETUNE indicator must remain lit.

Step 15. On the power supply panel, operate POWER-ON/OFF switch to OFF; RETUNE indicator must go out. After 15 seconds, operate POWER-ON/OFF switch to ON; NORMAL indicator must light.

Step 16. Rotate TUNE/OPERATE switch to OFF.

Step 17. On antenna coupler 1A2, ensure that the OUTPUT COUPLING control is in its maximum DECREASE position at the stop, and repeat steps 2 through 16 for that antenna coupler.

Step 18. On antenna coupler 1A3, ensure that the OUTPUT COUPLING control is in its maximum DECREASE position at the stop, and repeat steps 2 through 16 for that antenna coupler.

Step 19. On antenna coupler 1A4, ensure that the OUTPUT COUPLING control is in its maximum DECREASE position at the stop, and repeat steps 2 through 16.

5.2.1.5.1.3 Inhibit Circuits

The inhibit circuits check ensures that one, and only one, antenna coupler within a coupler group will have access to the power attenuator and tune reflectometer at any given time. This check involves all antenna couplers in the coupler group operating in several combinations, and is based on the minimum number of such combinations required to determine that the inhibit circuits in each antenna coupler are performing properly.

Note

The entire coupler group must be secured for these procedures.

The procedures are given in table 5-4. Perform each step separately and in the order given to minimize the time required to perform the check. The table is designed so that the TUNE/OPERATE switch on only one or two antenna couplers must be changed from step to step. Do not disturb the TUNE/OPERATE switch on any antenna coupler where it is the same from one step to the next.

In steps 10, 20, 30 and 40, rotate the OUTPUT COUPLING control on the antenna coupler under test at least two revolutions in the INCREASE direction while the TUNE/OPERATE switch is in TUNE-3 before rotating the switch to OPERATE. In steps 12, 22, 32, and 42, rotate the OUTPUT COUPLING control on the antenna coupler under test in the maximum DECREASE direction to the stop when the TUNE/OPERATE switch is rotated to the OFF position from the TUNE-3 position.

Refer to paragraph 4.3.5.3.4.4 for a description and simplified schematic diagram of the inhibit circuits.

TABLE 5-4. PROCEDURES FOR CHECKING INHIBIT CIRCUITS

STEP	COUPLER 1A1		COUPLER 1A2		COUPLER 1A3		COUPLER 1A4	
	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS
1	OFF	Out	OFF	Out	OFF	Out	OFF	Out
2	TUNE 1	NORMAL						
3	TUNE 1	NORMAL	TUNE 1	RETUNE				
4	TUNE 1	NORMAL	OFF	Out	TUNE 1	RETUNE		
5	TUNE 1	NORMAL			OFF	Out	TUNE 1	RETUNE
6	TUNE 2	NORMAL					TUNE 1	RETUNE
7	TUNE 3	NORMAL					TUNE 1	RETUNE
8	TUNE 3	NORMAL			TUNE 1	RETUNE	OFF	Out
9	TUNE 3	NORMAL	TUNE 1	RETUNE	OFF	Out		
10	OPERATE	NORMAL	TUNE 1	NORMAL				
11	TUNE 3	RETUNE	TUNE 1	NORMAL				

TABLE 5-4. PROCEDURES FOR CHECKING INHIBIT CIRCUITS (Continued)

	COUPLER 1A1		COUPLER 1A2		COUPLER 1A3		COUPLER 1A4	
STEP	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS
12	OFF	Out	TUNE 1	NORMAL				
13	TUNE 1	RETUNE	TUNE 1	NORMAL				
14	OFF	Out	TUNE 1	NORMAL	TUNE 1	RETUNE		
15			TUNE 1	NORMAL	OFF	Out	TUNE 1	RETUNE
16			TUNE 2	NORMAL			TUNE 1	RETUNE
17			TUNE 3	NORMAL			TUNE 1	RETUNE
18			TUNE 3	NORMAL	TUNE 1	RETUNE	OFF	Out
19	TUNE 1	RETUNE	TUNE 3	NORMAL	OFF	Out		
20	OFF	Out	OPERATE	NORMAL	TUNE 1	NORMAL		
21			TUNE 3	RETUNE	TUNE 1	NORMAL		
22			OFF	Out	TUNE 1	NORMAL		
23	TUNE 1	RETUNE			TUNE 1	NORMAL		
24	OFF	Out	TUNE 1	RETUNE	TUNE 1	NORMAL		
25			OFF	Out	TUNE 1	NORMAL	TUNE 1	RETUNE
26					TUNE 2	NORMAL	TUNE 1	RETUNE
27					TUNE 3	NORMAL	TUNE 1	RETUNE
28			TUNE 1	RETUNE	TUNE 3	NORMAL	OFF	Out
29	TUNE 1	RETUNE	OFF	Out	TUNE 3	NORMAL		
30	OFF	Out			OPERATE	NORMAL	TUNE 1	NORMAL
31					TUNE 3	RETUNE	TUNE 1	NORMAL
32					OFF	Out	TUNE 1	NORMAL
33	TUNE 1	RETUNE					TUNE 1	NORMAL
34	OFF	Out	TUNE 1	RETUNE			TUNE 1	NORMAL
35			OFF	Out	TUNE 1	RETUNE	TUNE 1	NORMAL
36					TUNE 1	RETUNE	TUNE 2	NORMAL
37					TUNE 1	RETUNE	TUNE 3	NORMAL
38			TUNE 1	RETUNE	OFF	Out	TUNE 3	NORMAL
39	TUNE 1	RETUNE	OFF	Out			TUNE 3	NORMAL
40	TUNE 1	NORMAL					OPERATE	NORMAL
41	TUNE 1	NORMAL					TUNE 3	RETUNE
42	OFF	Out	OFF	Out	OFF	Out	OFF	Out

5.2.1.5.1.4 Transmitter Keyline, Transmitter Interlock, and Drawer Interlock Circuits

The transmitter keyline circuit check ensures that the transmitter rf will be removed from the rf relay assembly when the antenna coupler switches from the TUNE to OPERATE or the OPERATE to TUNE modes. The transmitter interlock circuit check ensures that the transmitter will shut down when a RETUNE condition is present on the associated antenna coupler. The drawer interlock circuit check ensures that the transmitter will shut down if the associated antenna coupler drawer is not in the fully closed position. Refer to paragraph 4.3.5.3.4.1 for a description and simplified schematic diagram of these circuits.

CAUTION

Do not perform these procedures as part of installation checkout until the control system has been calibrated in accordance with paragraph 5.2.1.5.4. During installation, RF POWER must not be applied to the coupler group until all control circuits have been properly checked and calibrated.

Step 1. On antenna coupler 1A1, rotate TUNE/OPERATE switch to TUNE-1. NORMAL indicator must light.

Step 2. Tune and load associated transmitter in accordance with the technical manual for the transmitter.

Step 3. Bring the antenna coupler up to the final tuning procedure for the TUNE/OPERATE switch in TUNE-3 position in accordance with instructions given in paragraph 3.2.2.2, steps 1 through 9 of the Operator's Handbook. NORMAL indicator must remain lit.

Step 4. Depress (PUSH TO TURN) and hold TUNE/OPERATE switch. NORMAL INDICATOR must remain lit, RF POWER FORWARD meter must indicate zero.

CAUTION

In steps 5 and 7, do not rotate TUNE/OPERATE switch unless RF POWER FORWARD meter drops to zero. If meter does not indicate as required, deenergize the transmitter and secure the antenna coupler in accordance with paragraph 3.3.2.5. Troubleshoot the transmitter keyline circuit.

Step 5. Rotate TUNE/OPERATE switch to OPERATE and release the switch. NORMAL indicator must remain lit, RF POWER meter must indicate transmitter output power, and transmitter must operate normally.

Step 6. Depress (PUSH TO TURN) and hold TUNE/OPERATE switch. NORMAL indicator must remain lit, RF POWER FORWARD meter must indicate zero, and transmitter must again interrupt.

Step 7. Rotate TUNE/OPERATE switch to TUNE-3 and release the switch. NORMAL indicator must remain lit, RF POWER FORWARD meter must indicate transmitter output power and transmitter must operate normally.

Note

Do not adjust OUTPUT COUPLING control until directed.

Step 8. Reduce transmitter output power to the lowest possible level.

Step 9. Rotate TUNE/OPERATE switch to TUNE-2. Transmitter must shut down, RETUNE indicator on antenna coupler must light, and NORMAL indicator must go out.

Step 10. Rotate TUNE/OPERATE switch to OFF, and OUTPUT COUPLING control in the maximum DECREASE direction to the stop.

Step 11. Remove the six screws securing the antenna coupler drawer to the equipment cabinet, but do not pull the drawer out.

Step 12. Rotate TUNE/OPERATE switch to TUNE-1. NORMAL indicator must light.

Step 13. Restart the transmitter and apply the lowest possible power output to the antenna coupler. NORMAL indicator on antenna coupler must remain lit.

Step 14. Pull antenna coupler drawer out from the equipment cabinet. Transmitter must shut down.

Step 15. Rotate TUNE/OPERATE switch to OFF.

Step 16. Close and secure the antenna coupler drawer by replacing the six screws removed in step 11.

Step 17. On antenna coupler 1A2, rotate TUNE/OPERATE switch to TUNE-1 (NORMAL indicator must light), and repeat steps 2 through 16 for that antenna coupler.

Step 18. On antenna coupler 1A3, rotate TUNE/OPERATE switch to TUNE-1 (NORMAL indicator must light) and repeat steps 2 through 16 for that antenna coupler.

Step 19. On antenna coupler 1A4, rotate TUNE/OPERATE switch to TUNE-1 (NORMAL indicator must light), and repeat steps 2 through 16 for that antenna coupler.

5.2.1.5.2 Relative Measurement of Insertion Loss

The following procedures establish the reference standards for the relative insertion loss and settings of the OUTPUT COUPLING control for standard operating parameters of each antenna coupler in the coupler group. The reference standards are used to evaluate the performance of the rf circuits within the equipment as a quick check for deterioration of performance. The relative measurement of insertion loss is not as precise as the detailed measurement procedure given in paragraph 5.2.1.5.5, but it is a much simpler procedure to perform and will provide data that is sufficient to evaluate the overall performance of the antenna coupler.

To obtain repeatable OUTPUT COUPLING numbers all antenna couplers in each coupler group should be restored to the standard position in the equipment cabinet (the position at installation, see paragraph 2.4.3.3); the same dummy load should be used each time the procedure is performed; and the dummy load should be checked to ensure that its characteristics have not deviated more than ±1 ohm from the value stamped on the nameplate or from previously measured values.

If these procedures yield measurements that might indicate a deterioration of performance, refer to paragraph 5.2.1.5.3 and perform the worst case, 3-to-1 vswr load measurement as a further check.

5.2.1.5.2.1 Test Equipment and Test Setup

The test equipment required for the measurement of relative insertion loss is given below; the test setup required is shown in figure 5-3.

a. One transmitter, on board, 2 to 30 mc, 1 kw average

b. One electrical dummy load, DA-242/U

c. One multimeter, ME-303/U

d. Two coaxial "T" probe adaptors, HP-11042A or equivalent

e. RF cables and adaptors, as required

5.2.1.5.2.2 Measurement Procedures

Perform the procedures given below for each antenna coupler in the group. For consistency and to minimize the time required, measure the characteristics of antenna coupler 1A1 and repeat the procedures for antenna couplers 1A2, 1A3, and 1A4 in that order for the lower test frequency. For the upper test frequency, reverse the order and measure the characteristics of antenna couplers 1A4, 1A3, 1A2, and 1A1. For an eight-channel configuration repeat the entire procedure for the second coupler group.

Step 1. Secure the complete coupler group (both groups for an eight-channel configuration) in accordance with paragraph 3.3.2.5 of the Operator's Handbook.

Step 2. Connect test equipment as shown in figure 5-3. Connect transmitter output test cable to the input (1A6A2J1) of antenna coupler 1A1.

Step 3. Set transmitter to the lower test frequency (F1) in table 5-5.

Step 4. Refer to paragraph 3.3.2, and tune and load the transmitter and antenna coupler for normal operation. Bring the antenna coupler up to the operate condition using a nominal 1-kw average (cw) transmitter power. Allow 15 minutes for the antenna coupler to warm up.

Step 5. Adjust transmitter power as required to obtain an indication of 1 kw on antenna coupler RF POWER FORWARD meter.

Step 6. Record FREQ ADJUST INPUT, FREQ ADJUST OUTPUT, and OUTPUT COUPLING control settings on the data sheet (see table 5-6).

Step 7. Set multimeter ME-303/U to the 300-volt ac scale.

WARNING

> Use extreme care when performing steps 8 and 9. High rf voltages that may cause serious and painful burns are present at the coaxial "T" probe connectors.

Step 8. Insert the probe of the multimeter into the coaxial T probe connector installed between the transmitter and antenna coupler. Record the voltage indication on the multimeter as RF Input Volts in the data sheet.

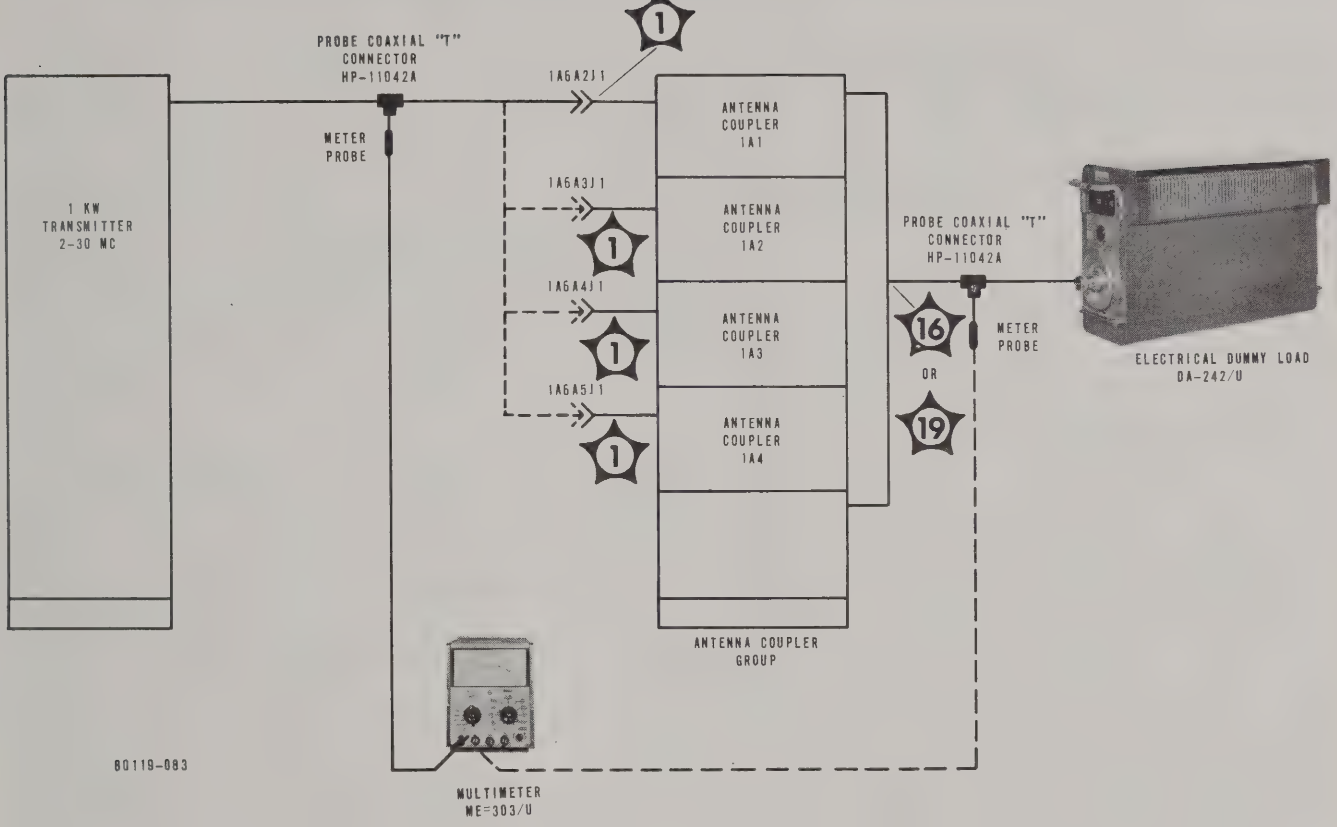

PROBE COAXIAL "T" CONNECTOR HP-11042A
METER PROBE
1 KW TRANSMITTER 2-30 MC
1A6A2J1
1
ANTENNA COUPLER 1A1
1A6A3J1
1
ANTENNA COUPLER 1A2
1A6A4J1
1
ANTENNA COUPLER 1A3
1A6A5J1
1
ANTENNA COUPLER 1A4
ANTENNA COUPLER GROUP
PROBE COAXIAL "T" CONNECTOR HP-11042A
16
OR
19
METER PROBE
ELECTRICAL DUMMY LOAD DA-242/U
80119-083
MULTIMETER ME=303/U

Figure 5-3. Test Setup for Relative Measurement of Insertion Loss

TABLE 5-5. TEST FREQUENCIES FOR MEASUREMENT OF INSERTION LOSS

COUPLER GROUP	ANTENNA COUPLER	LOWER TEST FREQUENCY (F1)	UPPER TEST FREQUENCY (F2)
AN/SRA-56	CU-1772	1.95 mc	6.15 mc
AN/SRA-58	CU-1774	3.90 mc	12.30 mc
AN/SRA-59	CU-1776	9.75 mc	30.75 mc

Step 9. Transfer the probe of the multimeter to the coaxial "T" probe connector between the output of the coupler group (or impedance matching network) and the dummy load. Record the voltage indication on the multimeter as the RF Output Volts in the data sheet.

Step 10. Divide the rf output voltage obtained in step 9 by the rf input voltage obtained in step 8.

TABLE 5-6 SAMPLE DATA SHEET FOR RELATIVE MEASUREMENT OF INSERTION LOSS

Antenna Coupler Group AN/SRA-____ Date ________________

Equipment Cabinet Serial Number ____________

Dummy Load Serial Number _____________

ITEM	ANTENNA COUPLER			
	1A1	1A2	1A3	1A4
Serial Number				

LOWER FREQUENCY LIMIT

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
RF Input Voltage				
RF Output Voltage				
Insertion Loss				

UPPER FREQUENCY LIMIT

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
RF Input Voltage				
RF Output Voltage				
Insertion Loss				

Remarks ____

Step 11. Refer to table 5-7 and convert the voltage ratio obtained in step 10 to db. Record this value as Relative Insertion Loss in the data sheet.

TABLE 5-7. CONVERSION TABLE FOR VOLTAGE RATIO TO DB

VOLTAGE RATIO	DB	VOLTAGE RATIO	DB	VOLTAGE RATIO	DB
0.891	1.0	0.794	2.0	0.708	3.0
0.881	1.1	0.785	2.1	0.700	3.1
0.871	1.2	0.776	2.2	0.692	3.2
0.861	1.3	0.767	2.3	0.684	3.3
0.851	1.4	0.759	2.4	0.676	3.4
0.841	1.5	0.750	2.5	0.668	3.5
0.832	1.6	0.741	2.6	0.661	3.6
0.822	1.7	0.739	2.7	0.653	3.7
0.813	1.8	0.724	2.8	0.646	3.8
0.804	1.9	0.716	2.9	0.683	3.9

Step 12. Deenergize the transmitter and secure the antenna coupler in accordance with paragraph 3.3.2.5.

Step 13. Transfer the transmitter output test cable from antenna coupler 1A1 to the input (1A6A3J1) of antenna coupler 1A2, and repeat steps 4 through 12 for antenna coupler 1A2.

Step 14. Transfer the transmitter output test cable from antenna coupler 1A2 to the input (1A6A4J1) of antenna coupler 1A3, and repeat steps 4 through 12 for antenna coupler 1A3.

Step 15. Transfer the transmitter output test cable from antenna coupler 1A3 to the input (1A6A5J1) of antenna coupler 1A4, and repeat steps 4 through 12 for antenna coupler 1A4.

Step 16. Set transmitter to the upper test frequency (F2) in table 5-5, and repeat steps 4 through 12 for antenna coupler 1A4.

Step 17. Transfer the transmitter output test cable from antenna coupler 1A4 to the input (1A6A4J1) of antenna coupler 1A3, and repeat steps 4 through 12 for antenna coupler 1A3.

Step 18. Transfer the transmitter output test cable from antenna coupler 1A3 to the input (1A6A3J1) of antenna coupler 1A2 and repeat steps 4 through 12 for antenna coupler 1A2.

Step 19. Transfer the transmitter output test cable from antenna coupler 1A1 to the input (1A6A2J1) of antenna coupler 1A1, and repeat steps 4 through 12 for antenna coupler 1A1.

Step 20. Remove all test equipment and secure the coupler group in accordance with paragraph 3.3.2.5.

5.2.1.5.3 Worst-Case, 3-to-1 Load Check

The following procedures establish the reference standards for evaluating the performance of each antenna coupler under the worst case, 3-to-1 load condition. If the antenna coupler input vswr of 1.05 to 1 or less can be maintained when operating into this load, the equipment is within specification and acceptable. However, an input vswr as high as 1.1 to 1 does not necessarily mean that the antenna coupler or coupler group must be pulled for corrective maintenance since the instrumentation used is only accurate to ±5 percent.

On the 3-to-1 vswr circle, two points are used in evaluating the performance of the equipment. The first point, determined by test cable A, is used as a standard or control point for the worst-case measurement. The second point, determined by cable B, is the worst-case (most difficult to match) point on the 3-to-1 vswr circle.

To obtain repeatability of dial indicators (especially OUTPUT COUPLING), restore the antenna couplers to their original position at the time of installation, use the same dummy loads and ensure that dummy load characteristics do not vary more than ±1 ohm from their nominal 50-ohm value.

If these procedures yield measurements that might indicate a deterioration of performance, refer to paragraph 5.2.1.5.5 and perform the detailed measurement of insertion loss as a further check.

5.2.1.5.3.1 Test Equipment and Test Setup

The test equipment required for the measurement of the worst-case, 3-to-1 vswr load performance of each antenna coupler is given below; the test setup required is shown in figure 5-4.

a. One transmitter, on board, 2 to 30 mc, 1 kw average

b. Three electrical dummy loads, DA-242/U

c. One rf wattmeter bidirectional power monitor, 2 to 30 mc, Sierra Model 164-FMN (with model 270A-30 plug in 50/100/500/1000 watt element), or equivalent

d. RF test cables, special (see paragraph 5.2.1.2.2)

e. RF cables and adaptors, as required

5.2.1.5.3.2 Measurement Procedures

Perform the procedures given below for each antenna coupler in the group or eight-channel configuration. For consistency, start the procedures with antenna coupler 1A1, and repeat the procedures for antenna couplers 1A2, 1A3, and 1A4 in that order. For an eight-channel configuration, repeat the entire procedure for the second coupler group.

Step 1. Secure the complete coupler group (both groups for an eight-channel configuration) in accordance with paragraph 3.3.2.5 of the Operator's Handbook.

Step 2. Connect the bidirectional power monitor between the input (1A6A2J1) of antenna coupler 1A1 and the transmitter (see figure 5-4).

Step 3. Connect special test cable A between the combiner output (1A6J1), or impedance matching network output (1J1), and the dummy loads (see figure 5-4).

Step 4. Set the transmitter to the test frequency given in table 5-8.

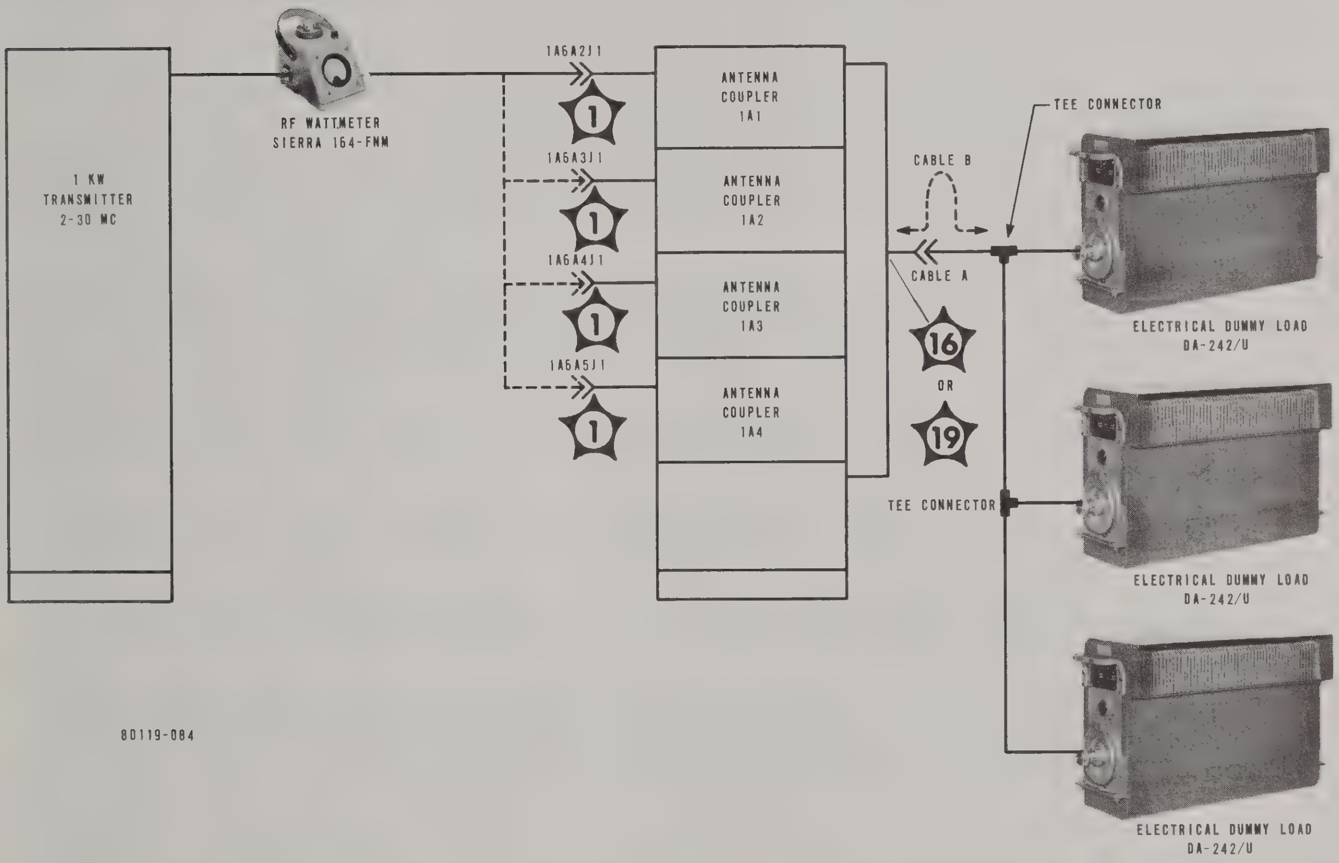

1 KW
TRANSMITTER
2-30 MC
RF WATTMETER
SIERRA 164-FNM
1A6A2J1
1
1A6A3J1
1
1A6A4J1
1
1A6A5J1
1
ANTENNA
COUPLER
1A1
ANTENNA
COUPLER
1A2
ANTENNA
COUPLER
1A3
ANTENNA
COUPLER
1A4
CABLE B
CABLE A
16
OR
19
TEE CONNECTOR
TEE CONNECTOR
ELECTRICAL DUMMY LOAD
DA-242/U
ELECTRICAL DUMMY LOAD
DA-242/U
ELECTRICAL DUMMY LOAD
DA-242/U
80119-084

Figure 5-4. Test Setup for Worst-Case, 3-to-1 VSWR Load Check

TABLE 5-8. TEST FREQUENCIES FOR WORST-CASE, 3-TO-1 VSWR LOAD CHECK

COUPLER GROUP	ANTENNA COUPLER	SINGLE GROUP	8-CHANNEL CONFIGURATION
AN/SRA-56	CU-1772	2.0 mc	3.0 mc
AN/SRA-57	CU-1774	4.0 mc	4.0 mc
AN/SRA-58	CU-1776	16.0 mc	——

Step 5. Set the bidirectional power monitor to indicate 1000 watts forward power.

CAUTION

> Do not start transmitter until bidirectional power monitor is set as required in step 5.

Step 6. Refer to paragraphs 3.2.2, and tune and load the transmitter and antenna coupler for normal operation. Using an initial value of approximately 1 kw average (cw) transmitter power as indicated on the bidirectional power monitor, bring the antenna coupler up to the operate condition. Allow 15 minutes for antenna coupler to warm up.

Step 7. Adjust transmitter output power as required to obtain as close as possible, an indication of 1-kw forward power on the bidirectional power monitor.

Step 8. Set the bidirectional power monitor to indicate 1000 watts reflected power and progressingly switch the element to the more sensitive ranges until the power monitor indicates the power reflected by the channel.

Step 9. Unlock and carefully rotate the OUTPUT COUPLING and FREQ ADJUST OUTPUT controls to obtain a minimum indication (null) on the power monitor that is as near zero as possible. Record the exact reflected and forward power as indicated by the power monitor on the data sheet (table 5-9).

Step 10. Record the FREQ ADJUST INPUT, FREQ ADJUST OUTPUT, and OUTPUT COUPLING control settings in the data sheet.

Step 11. Divide the reflected power (P_R) obtained in step 10 by the forward power (P_F) obtained in step 9 and multiply the ratio by 1000.

Step 12. Refer to table 5-10 and convert the power ratio obtained in step 11 to vswr. Record this value of vswr in the data sheet.

Step 13. Under "Remarks" in the data sheet, record any unusual conditions observed during the measurement procedures (especially any significant drift in the reflected power indication on the power monitor and the time over which it occurred.

Step 14. Deenergize the transmitter and secure the antenna coupler in accordance with paragraph 3.3.2.5.

Step 15. Replace special test cable A with special test cable B between the coupler group output (1A4J1) or impedance matching network (1J1) and the dummy loads (see figure 5-4).

Note

> For eight-channel configurations of Antenna Coupler Groups AN/SRA-57, ensure that the proper test cable B is used.

Step 16. Repeat steps 5 through 14 for the worst-case point.

Step 17. Transfer the transmitter output test cables with bidirectional power monitor from antenna coupler 1A1 to the input (1A6A3J1) of antenna coupler 1A2, and repeat steps 3 through 16.

Step 18. Transfer the transmitter output test cables with bidirectional power monitor from antenna coupler 1A2 to the input (1A6A4J1) of antenna coupler 1A3, and repeat steps 3 through 16.

TABLE 5-9 SAMPLE DATA SHEET FOR WORST-CASE, 3 TO 1 VSWR LOAD CHECK

Antenna Coupler Group AN/SRA-____ Date ______________

Equipment Cabinet Serial Number ____________

Dummy Load Serial Numbers (a) ____________, (b) ______________, (c) _______________

ITEM	ANTENNA COUPLER			
	1A1	1A2	1A3	1A4
Serial Number				

MEASUREMENT WITH TEST CABLE A

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
Forward Power (measured)				
Reflected Power (measured)				
VSWR				

MEASUREMENT WITH TEST CABLE B

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
Forward Power (measured)				
Reflected Power (measured)				
VSWR				

Remarks ____

____

____

TABLE 5-10. CONVERSION TABLE FOR REFLECTED TO FORWARD POWER RATIO TO VSWR

$\frac{P_R}{P_F} \times 10^3$	VSWR	$\frac{P_R}{P_F} \times 10^3$	VSWR	$\frac{P_R}{P_F} \times 10^3$	VSWR
0.025	1.01	2.27	1.10	53.3	1.60
0.098	1.02	4.87	1.15	81.6	1.80
0.218	1.03	8.26	1.20	111.1	2.00
0.384	1.04	12.34	1.25	140.6	2.20
0.595	1.05	17.01	1.30	169.6	2.40
0.848	1.06	22.18	1.35	197.5	2.60
1.143	1.07	27.78	1.40	224.4	2.80
1.480	1.08	33.74	1.45	250.0	3.00
1.854	1.09	40.00	1.50	274.4	3.20

Step 19. Transfer the transmitter output test cables with bidirectional monitor from antenna coupler 1A3 to the input (1A6A5J1) of antenna coupler 1A4, and repeat steps 3 through 16.

Step 20. Remove all test equipment and secure the coupler group(s) in accordance with paragraph 3.3.2.5.

5.2.1.5.4 Control System Calibration

The following procedures establish certain critical values for the proper operation of the control circuits within an antenna coupler. Also included in these procedures are several alternate or additional checks of the control circuit that are used in troubleshooting and installation checkout.

The control circuit checks in this procedure ensure the proper operation of the voltage sensors, transmitter interlock, transmitter keyline, rf relay control, and automatic decoupling circuit.

The control circuit calibration procedures cover the excessive vswr and overvoltage protective circuits, voltage sensor adjustments, and RF POWER REFLECTED meter circuit.

Perform all procedures given below for each antenna coupler in the group. For consistency, start the calibration procedures with antenna coupler 1A1, and repeat the procedures for antenna couplers 1A2, 1A3, and 1A4 in that order. Repeat the entire procedure for the second antenna coupler group for an eight-channel configuration.

5.2.1.5.4.1 Test Equipment

The following test equipment is required for these procedures.

a. One multimeter, AN/PSM-4D

b. One digital voltmeter, Digitec Model 202, or equivalent

c. One control system cable and test set special (see paragraph 5.2.1.2.1)

5.2.1.5.4.2 Voltage Sensor Check

This check ensures that voltage sensor components are within specification prior to calibration of the associated circuits. Refer to paragraph 4.3.5.3.3.1 for a description and simplified schematic diagram of the voltage sensors.

Step 1. Secure the antenna coupler under test by rotating the TUNE/OPERATE switch to OFF, and the OUTPUT COUPLING control in the DECREASE direction to the stop.

Step 2. Remove the six screws that secure the antenna coupler drawer to the equipment cabinet, and pull the coupler drawer out to the stops.

Step 3. Remove the control cable from receptacle J1 on the rear of the coupler drawer (see figures 5-32 for location of J1).

Step 4. Remove the bottom cover from the coupler drawer.

Step 5. Remove control circuit board A1 (see figure 5-5).

Step 6. Set the multimeter to measure resistance.

Step 7. On voltage sensor A3, connect positive lead of multimeter to terminal E1 and negative lead to terminal E3 (see figure 5-6 for location of terminals). Multimeter must indicate less than 10 ohms.

Step 8. Connect positive lead of multimeter to terminal E1 and negative lead to terminal E4. Multimeter must indicate between 20 K and 30 K ohms.

Step 9. Reverse multimeter leads so that the positive lead is connected to terminal E4 and negative lead to terminal E1. Multimeter must indicate approximately 250 K.

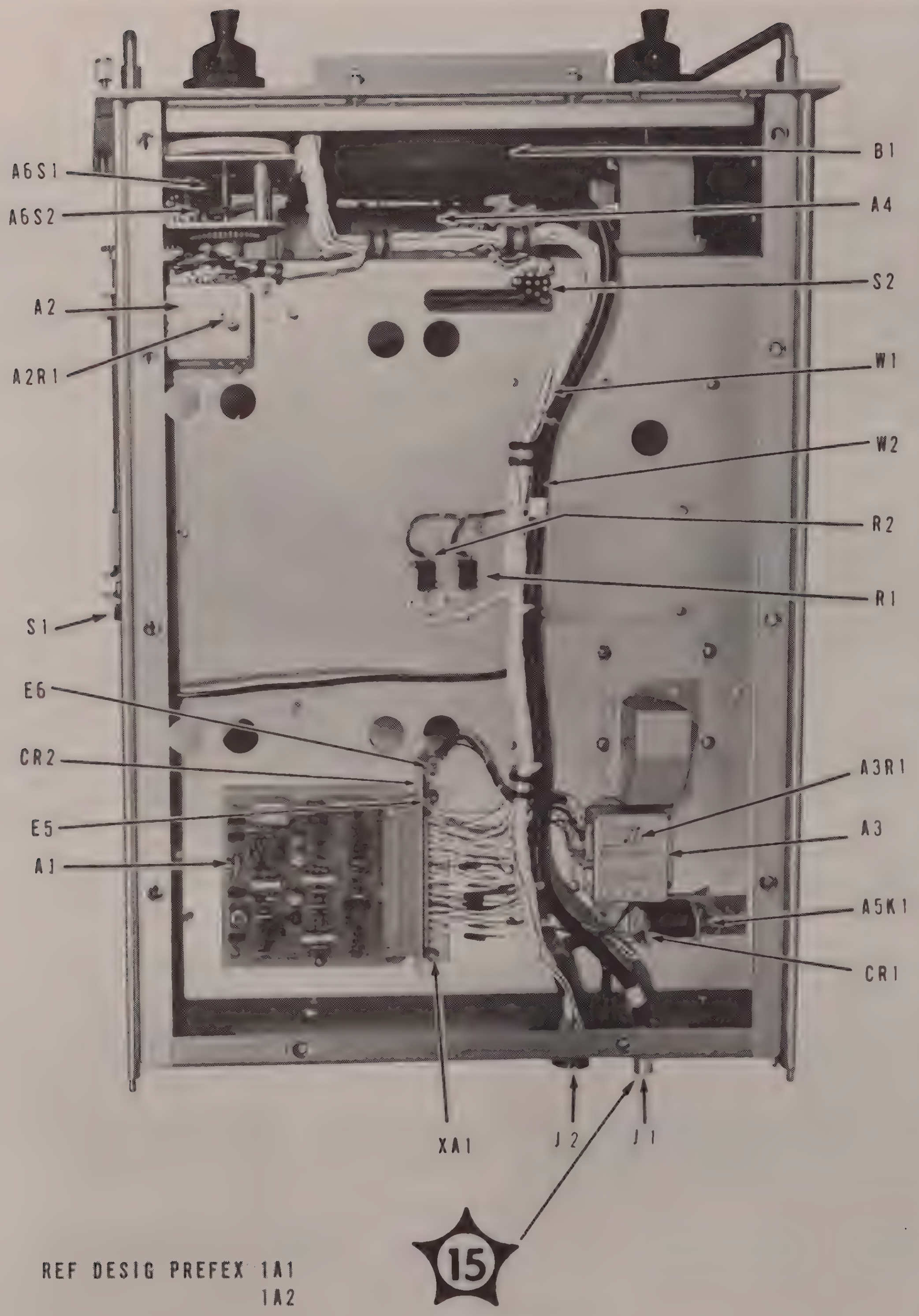
Step 10. Disconnect multimeter from voltage sensor A3 and repeat step 7 for voltage sensor A2. Multimeter must indicate an open circuit.

Step 11. Repeat steps 8 and 9 for voltage sensor A2.

Step 12. Disconnect multimeter and replace control circuit board A1.

5.2.1.5.4.3 Transmitter Interlock and Keyline, Automatic Decoupling, and RF Relay Control Circuit Checks

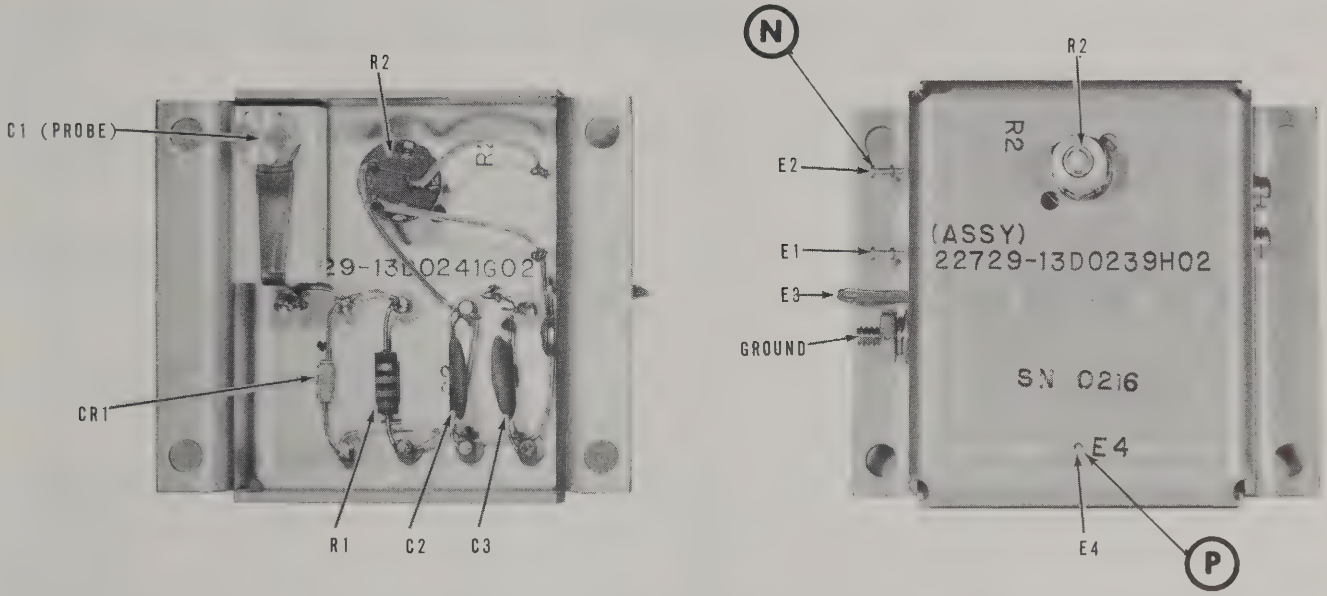
These circuit checks ensure that the transmitter interlock and keyline, automatic decoupling, and rf relay control circuits operate as required during the tuning and operating procedures. This check of the transmitter interlock and keyline must be performed as part of the


A6S1
A6S2
A2
A2R1
S1
E6
CR2
E5
A1
B1
A4
S2
W1
W2
R2
R1
A3R1
A3
A5K1
CR1
XA1
J2
J1
15

REF DESIG PREFEX 1A1
1A2
1A3
1A4

80119-031

Figure 5-5 Antenna Coupler Bottom View, Location of Components



REF DESIG PREFIX 1A1A2, 1A1A3
1A2A2, 1A2A3
1A3A2, 1A3A3
1A4A2, 1A4A3

80119-025

Figure 5-6. Voltage Sensor, Location of Components

installation checkout prior to applying rf power to the antenna coupler (see paragraph 2.4.3.1). Refer to paragraphs 4.3.5.3.4.1, 4.3.5.3.4.3, and 4.3.5.3.4.4 for descriptions and simplified schematic diagrams of these circuits.

Step 1. Connect special control system cable and test set in series with the antenna coupler control cable and receptacle J1 at rear of coupler drawer.

Step 2. On test set, operate switch S3 to vswr, and rotate potentiometer R4 fully counterclockwise to obtain minimum output. (Refer to figure 5-1 for nomenclature on test set.)

Step 3. On the antenna coupler, tape the vane of the airflow switch 1A-S2 so that it is held in the normal operate position (see figure 5-5 for location of switch 1A-S2).

Step 4. Rotate TUNE/OPERATE switch to TUNE-1. Fan must run, NORMAL indicator must light, and automatic decoupling switch solenoid A5K1 must not energize. On test set, indicators DS1 (interlock), DS2 (keyline) and DS3 (rf relay control) must light.

Step 5. Rotate TUNE/OPERATE switch to TUNE-2; NORMAL indicator must remain lit and solenoid A5K1 must energize. On test set, indicators DS1, DS2, and DS3 must remain lit.

Step 6. Rotate TUNE/OPERATE switch to TUNE-3; NORMAL indicator must remain lit and solenoid A5K1 must remain energized. On test set, indicators DS1, DS2, and DS3 must remain lit.

Step 7. Rotate OUTPUT COUPLING control two revolutions in the INCREASE direction. NORMAL indicator must remain lit and solenoid A5K1 must remain energized. On test set, indicators DS1, DS2, and DS3 must remain lit.

Step 8. Depress (PUSH TO TURN) and hold the TUNE/OPERATE switch. NORMAL indicator must remain lit and solenoid A5K1 must remain energized. On test set, indicator DS2 must go out; indicators DS1 andDS3 must remain lit.

Step 9. Rotate TUNE/OPERATE switch to OPERATE and release the switch. NORMAL indicator must remian lit and solenoid A5K1 must remain energized. On test set, indicator DS3 must go out, DS2 must light, and DS1 must remain lit.

Step 10. Rotate OUTPUT COUPLING control in the DECREASE direction to the stop. RETUNE indicator must light, NORMAL indicator must go out, and solenoid A5K1 must deenergize. On test set, indicator DS1 must go out, DS2 remain lit, and DS3 remain out.

Step 11. Rotate OUTPUT COUPLING control two revolutions in the INCREASE direction. RETUNE indicator must remain lit and solenoid A5K1 must remain deenergized. On test set, indicators DS1 and DS3 must remain out; indicator DS2 must remain lit.

Step 12. On test set, press switch S4 and hold for 15 seconds. Release switch S4. Indicator DS1 must light, DS3 must remain out, and DS2 must remain lit. On antenna coupler solenoid A5K1 must energize, NORMAL indicator must light, and RETUNE indicator must go out.

5.2.1.5.4.4 Excessive VSWR Control and Protection Circuit Calibration

This procedure calibrates the excessive vswr circuit so that the protective devices will activate when the reflected power toward the transmitter reaches a vswr of 3 to 1 (250 watts reflected power for 1-kw forward power). This procedure is a continuation of the previous procedure (paragraph 5.2.1.5.4.3), and the final conditions of that procedure must be maintained: TUNE/OPERATE switch must be in the OPERATE position and NORMAL indicator must be lit. Refer to paragraph 4.3.5.3.4.7 for a description and simplified schematic diagram of the excessive vswr protective circuit.

Step 1. On the test set, rotate potentiometer R4 to its midrange position, and connect digital voltmeter to J4(+) and J5(-).

Step 2. Press and hold switch S1, and slowly rotate potentiometer R4 to increase the voltage indication on the digital voltmeter. Indication on antenna coupler RF POWER REFLECTED meter must also increase.

Step 3. Continue to rotate potentiometer R4 until digital voltmeter indicates 1.335 volts, or antenna coupler RETUNE indicator lights. Release switch S1.

Step 4. If RETUNE indicator lights when the digital voltmeter indicates less than 1.335 volts, proceed with step 5. If RETUNE indicator does not light when the digital voltmeter indicates 1.335 volts, proceed with step 8.

Step 5. On test set, press switch S4 and hold for 15 seconds. Release switch S4. On antenna coupler, NORMAL indicator must light and RETUNE indicator must go out.

Step 6. On the circuit control board A1, rotate the adjustment screw of potentiometer A1R21 one revolution counterclockwise and press S1 (see figure 5-43 for location of potentiometer A1R21).

Step 7. Repeat step 6 as often as required until RETUNE indicator does not light when the digital voltmeter indicates 1.335 volts.

Step 8. On test set, press and hold switch S1. On circuit control board, rotate the adjustment screw of potentiometer A1R21 counterclockwise until RETUNE indicator lights. Release switch S1.

Step 9. On test set, press switch S4 and hold for 15 seconds. Release switch S4. On antenna coupler, NORMAL indicator must light and RETUNE indicator must go out.

Step 10. Press switch S1. RETUNE indicator must light. RF POWER REFLECTED meter must indicate 250 ±12.5 watts.

5.2.1.5.4.5 Input Resonator Voltage Sensor A2 Calibration

This procedure sets input resonator voltage sensor A2 potentiometer so that a given output from the voltage sensor will indicate a given level on the RF POWER REFLECTED meter. These procedures are a continuation of the procedures given above and the final conditions of those procedures must be maintained: antenna coupler OUTPUT COUPLING control must be two revolutions in the INCREASE direction and the digital voltmeter must be connected to test set terminals J4(+) and J5(-). Refer to paragraphs 4.3.5.3.3.1 and 4.3.5.3.3.2 for descriptions and simplified schematic diagrams of the voltage sensor and RF POWER REFLECTED meter.

Step 1. On the test set, operate switch S3 to the overvoltage position.

Step 2. Press and hold switch S1, and rotate potentiometer R4 until the digital voltmeter indicates the calibration voltage for voltage sensor A2 given in table 5-11.

TABLE 5-11. CALIBRATION VOLTAGES FOR VOLTAGE SENSORS

COUPLER GROUP	ANTENNA COUPLER	VOLTAGE SENSOR A2	VOLTAGE SENSOR A3
AN/SRA-56	CU-1772	0.48 vdc	41.8 vdc
AN/SRA-57	CU-1774	0.12 vdc	26.8 vdc
AN/SRA-58	CU-1776	0.07 vdc	32.1 vdc

Step 3. Connect one test lead from test set terminal J2(+) to input resonator voltage sensor A2 terminal E4 and a second test lead from test set terminal J3(-) voltage sensor terminal E1.

Step 4. Rotate TUNE/OPERATE switch to TUNE-1. RETUNE indicator must light. (OUTPUT COUPLING not set properly.)

Step 5. On the test set, press and hold switch S1 and rotate input resonator voltage sensor A2 potentiometer R2 until RF POWER REFLECTED meter indicates 150 watts. Release switch S1.

Step 6. Rotate TUNE/OPERATE switch to OFF, and disconnect test leads from voltage sensor A2 and from the test set.

5.2.1.5.4.6 Overvoltage Protective Circuit Calibration

This procedure sets output resonator voltage sensor A3 potentiometer R2 so that a given output from the voltage sensor activates the protective devices in the overvoltage control circuit when the rf voltage in the output resonator exceeds 6.25 kv rms. Refer to paragraph 4.3.5.3.4.7 for a description and simplified schematic diagram of the overvoltage protective circuit.

Note

> This calibration procedure is relative. The overvoltage protective circuit may trip under peak load during operation. If this occurs, apply two-tone test signal from transmitter and adjust A3R2 to trip the circuit between 1100 and 1300 watts on the RF POWER FORWARD meter using trial and error methods.

Step 1. On the test set, connect the digital voltmeter between the test set output terminals J8(+) and J9(-).

Step 2. On the test set, press and hold switch S2, and rotate potentiometer R5 until the digital voltmeter indicates the calibration voltage for voltage sensor A3 in table 5-11.

Step 3. On the test set, connect one test lead from terminal (J6(+) to output resonator voltage sensor A3 terminal E4 and a second test lead from test set terminal J7(-) to voltage sensor terminal E1.

Step 4. Rotate TUNE/OPERATE switch to TUNE-3. RETUNE indicator must light.

Step 5. Onvoltage sensor A3, rotate potentiometer R2 counterclockwise to the stop.

Step 6. On test set, press switch S4 and hold for 15 seconds. Release switch S4. NORMAL indicator must light and RETUNE indicator must go out.

Step 7. On the test set press and hold switch S2, and rotate voltage sensor A3 potentiometer R2 until RETUNE indicator lights and NORMAL indicator goes out. Release switch S2.

Step 8. Press test set switch S4 and hold for 15 seconds. Release switch S4. NORMAL indicator must light and RETUNE indicator must go out.

Step 9. Press test set switch S2. RETUNE indicator must light and NORMAL indicator must go out. Release switch S2.

Step 10. If RETUNE indicator does not light as required in step 9 repeat steps 7 through 9 again.

Step 11. Rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING control in the DECREASE direction to the stop.

Step 12. Disconnect test leads and special control system cable and test set.

Step 13. Replace bottom cover, connect antenna coupler control cable, and secure the coupler drawer assembly within the equipment cabinet.

Step 14. Repeat the entire calibration procedure for the remaining antenna couplers in the group or configuration.

5.2.1.5.5 Detailed Measurement of Insertion Loss

The following procedures establish a more accurate value of insertion loss and a correlation with the relative insertion loss measured under paragraph 5.2.1.5.2. These procedures are not required under scheduled preventive maintenance, but are to be performed when previous reference standards measurements indicate a deterioration of performance. These procedures are also used in the installation checkout of the equipment to establish the initial reference standard for insertion loss.

In these procedures, the insertion loss is measured by substitution using a precision attenuator. The relative insertion loss is also measured at the same time so that the two measurements can be compared and the relative insertion loss values measured under paragraph 5.2.1.5.2 can be evaluated.

Follow these procedures only for those antenna couplers suspected of not being within specification (all antenna couplers for installation checkout). If these procedures indicate that trouble may be present in a particular antenna coupler, refer to paragraph 5.2.1.5.6 and perform the measurement of isolation as a further check.

5.2.1.5.5.1 Test Equipment and Test Setup

The test equipment required for the measurement of detailed insertion loss is given below; the test setup required is shown in figure 5-7.

a. One signal generator, SG-582/U

b. Two variable attenuators, CN-796/U

c. One variable attenuator, Telonic TC-50A, 0 to 10.9 db in 0.1-db steps

d. One digital electronic counter, CP-772/U

e. One electrical dummy load, DA-242/U

f. Two electronic voltmeters, AN/URM-155

g. Two coaxial switches, Bird 72A

h. One resistor, fixed, shielded, 1 K

Note

The test equipment for the measurement of relative insertion loss is also required (see paragraph 5.2.1.5.2.1).

5.2.1.5.5.2 Measurement Procedures

Step 1. Refer to paragraph 5.2.1.5.2.2, steps 1 through 14, and measure the relative insertion loss of the antenna coupler under test at the lower test frequency (F1) in table 5-5. Record relative insertion loss and all other related information in the data sheet (table 5-12).

Step 2. Leave the TUNE/OPERATE switch in OPERATE and deenergize the transmitter. Disconnect test equipment used in the measurement of relative insertion loss.

TABLE 5-12 SAMPLE DATA SHEET FOR DETAILED MEASUREMENT OF INSERTION LOSS

Antenna Coupler Group AN/SRA-____ Date ________________

Equipment Cabinet Serial Number ____________

Dummy Load Serial Number _____________

ITEM	ANTENNA COUPLER			
	1A1	1A2	1A3	1A4
Serial Number				

LOWER FREQUENCY LIMIT

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
RF Input Voltage				
RF Output Voltage				
Insertion Loss (Relative)				
Insertion Loss (Detailed)				

UPPER FREQUENCY LIMIT

Test Frequency				
FREQ ADJUST INPUT Dial				
FREQ ADJUST OUTPUT Dial				
OUTPUT COUPLING Dial				
RF Input Voltage				
RF Output Voltage				
Insertion Loss (Relative)				
Insertion Loss (Detailed)				

Remarks ____

____

Note

> Do not disturb the settings of FREQ ADJUST INPUT, FREQ ADJUST OUTPUT, or OUTPUT COUPLING controls through step 8.

Step 3. Connect the test equipment as shown in figure 5-7 and set coaxial switches so that main signal path is from the signal generator through the antenna coupler under test to the dummy load.

Step 4. Set the signal generator to the same frequency as the transmitter in step 1, using the digital electronic counter to obtain the precise frequency.

Step 5. Record the voltages indicated on the voltmeter 1 (input) and voltmeter 2 (output).

Step 6. Set the coaxial switches so that the main signal path is from the signal generator through the bypass precision attenuator to the dummy load.

Step 7. Ensure that the voltmeter 1 (input) indicates the same as in step 5 by readjusting the signal generator if necessary.

Step 8. Adjust the bypass precision attenuator until the voltmeter 2 (output) indicates the same as in step 5. The value of attenuation required to obtain the same indication is the measured insertion loss. Record this value on the data sheet (table 5-12).

Step 9. Disconnect all test equipment.

Step 10. Repeat steps 1 through 9 for the upper test frequency (F2) given in table 5-5.

Step 11. Secure the antenna coupler.

Step 12. Repeat steps 1 through 12 for other antenna couplers as required.

5.2.1.5.6 Isolation Between Channels

The following procedures measure the degree of isolation between channels in a coupler group or eight-channel configuration. It is isolation that prevents interaction between the several transmitters operating through the same group or configuration, provided that the transmitters are separated at least 5 percent in frequency.

The measurement of isolation is not required as part of scheduled preventive maintenance, but should be performed when previous reference standards measurements indicate that trouble may be present in the equipment and at installation to establish the initial reference standards.

In these procedures, the isolation between all channels must be determined because of the possibility that interaction may be caused by an antenna coupler not even suspected of being faulty. Before isolation between channels is measured, the characteristics of the channel (antenna coupler) ±5 percent off frequency must be determined to establish the attenuation of the rf signal from another transmitter coupling into that channel during operation.

For consistency, start the procedures by measuring the isolation between antenna couplers 1A1 and 1A2 and repeat the procedures to determine the isolation between antenna couplers 1A2 and 1A3, 1A3 and 1A4, and 1A4 and 1A1.

If the isolation measurements indicate that trouble may be present in an antenna coupler or coupler group, pull the equipment for corrective maintenance.

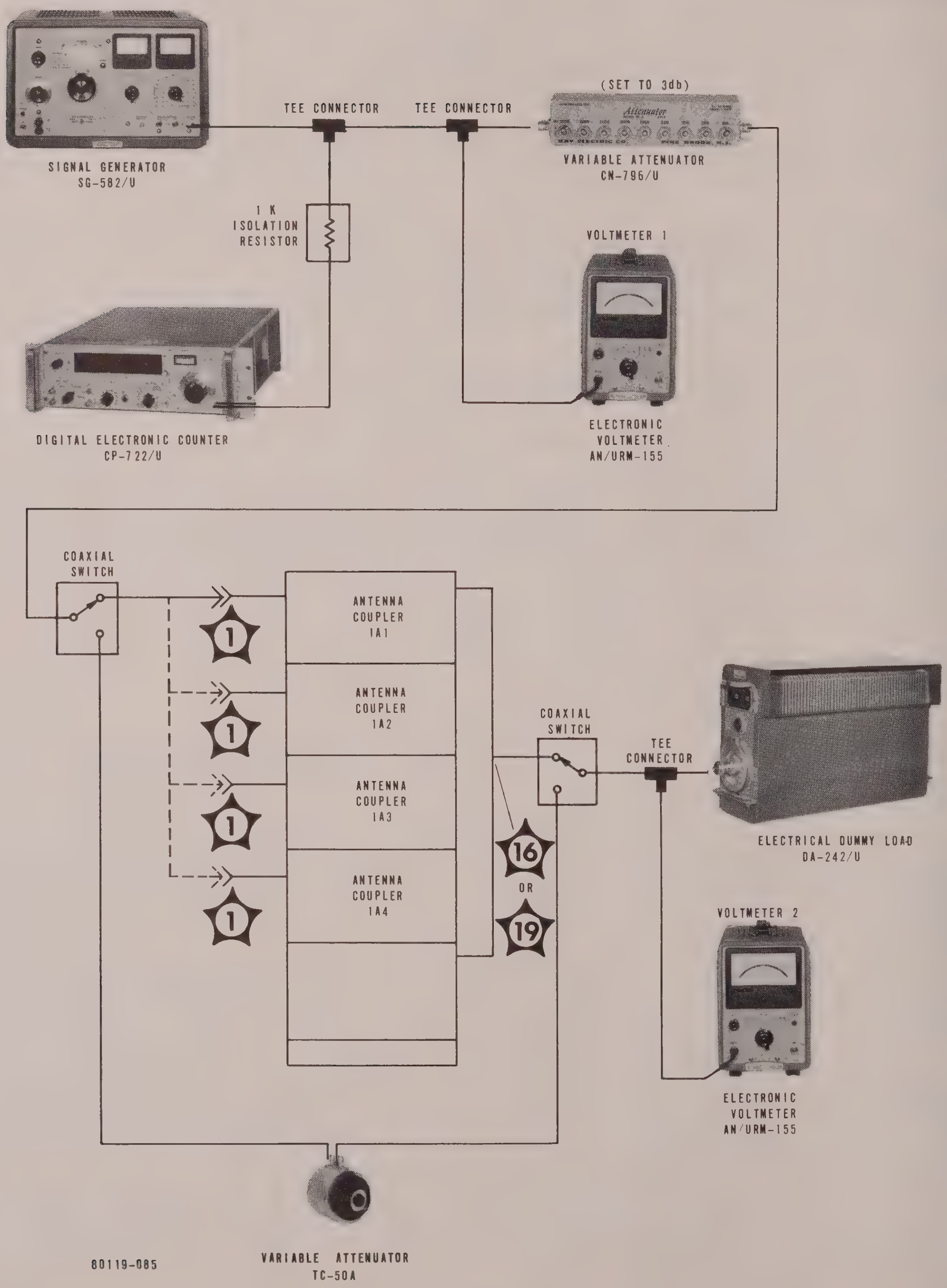

SIGNAL GENERATOR
SG-582/U
TEE CONNECTOR
TEE CONNECTOR
(SET TO 3db)
VARIABLE ATTENUATOR
CN-796/U
1 K
ISOLATION
RESISTOR
VOLTMETER 1
DIGITAL ELECTRONIC COUNTER
CP-722/U
ELECTRONIC
VOLTMETER
AN/URM-155
COAXIAL
SWITCH
ANTENNA
COUPLER
1A1
1
ANTENNA
COUPLER
1A2
1
ANTENNA
COUPLER
1A3
1
ANTENNA
COUPLER
1A4
1
16
OR
19
COAXIAL
SWITCH
TEE
CONNECTOR
ELECTRICAL DUMMY LOAD
DA-242/U
VOLTMETER 2
ELECTRONIC
VOLTMETER
AN/URM-155
80119-085
VARIABLE ATTENUATOR
TC-50A

Figure 5-7. Test Setup for Detailed Measurement of Insertion Loss

5.2.1.5.6.1 Test Equipment and Test Setups

The test equipment required for the measurement of isolation is given below, three test setups are required as shown in figures 5-8, 5-9, and 5-10.

a. One transmitter, on board, 2 to 30 mc, 1-kw average power

b. One signal generator, SG-582/U

c. One variable attenuator, CN-796/U

d. One digital electronic counter, CP-772/U

e. One electrical dummy load, DA-242/U

f. Two electronic voltmeters, AN/URM-155

g. One resistor, fixed, shielded, 1 K

h. One 50-ohm termination, Microlab/FRX TA-5MN

i. RF cables and connectors, as required

5.2.1.5.6.2 Measurement Procedures

The measurement of isolation consists of three parts. In the first part, an antenna coupler (channel A) is tuned to a test frequency (F), and the attenuation characteristics of channel A alone (all other channels are off) are determined at 5 percent off-frequency (F + 5% and F - 5%). In the second part, a second antenna coupler (channel B) is tuned 5 percent away (F + 5%, F - 5%) from the operating frequency (F) of channel A, and the attenuation characteristics of channel A are measured again to determine any interaction presented by channel B. In the third part, the isolation between channel A and channel B is determined from the attenuation of a signal (F ±5%) applied to the input of channel B as measured at the input of channel A (resonant at F).

Step 1. Designate the channel associated with antenna coupler 1A1 as channel A and the channel associated with antenna coupler 1A2 as channel B.

Step 2. Secure the complete coupler group (both groups for an eight-channel configuration) in accordance with paragraph 3.3.2.5. Ensure that the TUNE/OPERATE switch on antenna couplers 1A2, 1A3, and 1A4 are in the OFF position.

Step 3. Connect the test equipment as shown in figure 5-8 with transmitter connected to channel A.

Step 4. Set transmitter to the lower, center test frequency (F1) in table 5-13.

Step 5. Refer to paragraph 3.3.2 and tune and load the transmitter and antenna coupler for normal operation. Bring the antenna coupler up to the OPERATE condition. Allow 15 minutes for the antenna coupler to warm up.

Note

Leave the TUNE/OPERATE switch on the antenna coupler in OPERATE. Do not disturb any of the other controls for the remainder of these procedures.

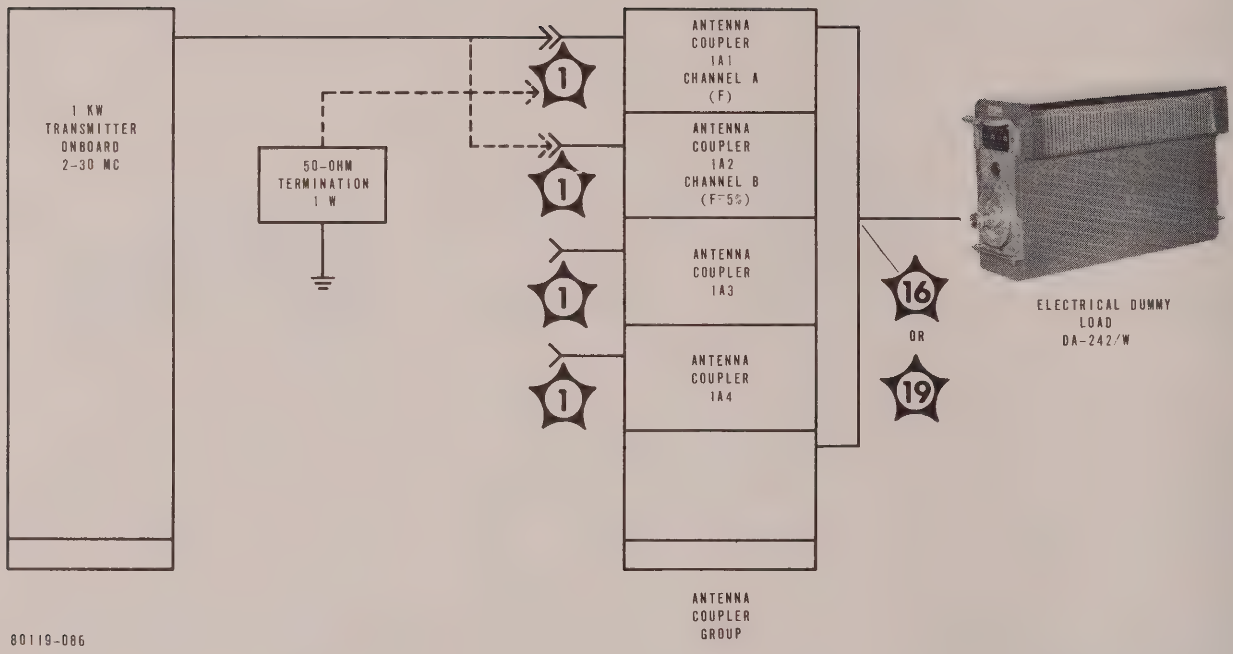

1 KW TRANSMITTER ONBOARD 2-30 MC
50-OHM TERMINATION 1 W
1
1
1
1
ANTENNA COUPLER 1A1 CHANNEL A (F)
ANTENNA COUPLER 1A2 CHANNEL B (F+5%)
ANTENNA COUPLER 1A3
ANTENNA COUPLER 1A4
16
OR
19
ELECTRICAL DUMMY LOAD DA-242/W
ANTENNA COUPLER GROUP
80119-086

Figure 5-8. Test Setup 1 for Measurement of Isolation

Step 6. Deenergize and disconnect the transmitter.

Step 7. Connect the test equipment as shown in figure 5-9 to channel A. Set the signal generator to the exact lower, center test frequency (F1) in table 5-13, using the electronic counter.

Step 8. Set the variable attenuator to 60 db.

Step 9. Adjust the signal generator output level to obtain an indication of 1 millivolt on voltmeter 2. Note the indication on voltmeter 1 and maintain this indication through step 12 by adjusting the signal generator output as required.

Step 10. Set the signal generator to 5 percent above center test frequency (F1 + 5%) shown in table 5-13.

Step 11. Adjust the variable attenuator until voltmeter 2 again indicates 1 millivolt.

Step 12. Subtract the attenuator setting in step 11 from that in step 8 (60 db) and record this value in the data sheet (table 5-14). The attenuation must be greater than 33 db.

TABLE 5-13. TEST SEQUENCE AND FREQUENCIES FOR MEASUREMENT OF ISOLATION

TEST SEQUENCE	CHANNEL A	CHANNEL B
1	1A1	1A2
2	1A2	1A3
3	1A3	1A4
4	1A4	1A5

TEST FREQUENCY	CENTER FREQUENCY F	OFF CENTER FREQUENCIES	
		F+5%	F-5%
ANTENNA COUPLER GROUP AN/SRA-56			
Lower (F1)	2.20 MC	2.31 MC	2.09 MC
Middle (F2)	4.00 MC	4.20 MC	3.80 MC
Upper (F3)	5.80 MC	6.09 MC	5.51 MC
ANTENNA COUPLER GROUP AN/SRA-57			
Lower (F1)	4.20 MC	4.41 MC	3.99 MC
Middle (F2)	8.00 MC	8.40 MC	7.60 MC
Upper (F3)	11.60 MC	12.80 MC	11.02 MC
ANTENNA COUPLER GROUP AN/SRA-58			
Lower (F1)	10.40 MC	10.92 MC	9.88 MC
Middle (F2)	20.00 MC	21.00 MC	19.00 MC
Upper (F3)	29.20 MC	30.66 MC	27.74 MC

Step 13. Disconnect test equipment shown in figure 5-9 and connect test equipment shown in figure 5-8. Connect transmitter to channel B and 50-ohm termination to the input of channel A.

Step 14. Set transmitter to 5 percent above center test frequency (F1 + 5%) and repeat steps 5 and 6 to tune channel B.

Step 15. Remove 50-ohm termination from input to channel A and connect it to the input to channel B.

Step 16. Repeat steps 7 through 13, to measure the loading effect of channel B on channel A at 5 percent above the center test frequency. This interaction attenuation must be greater than 23 db.

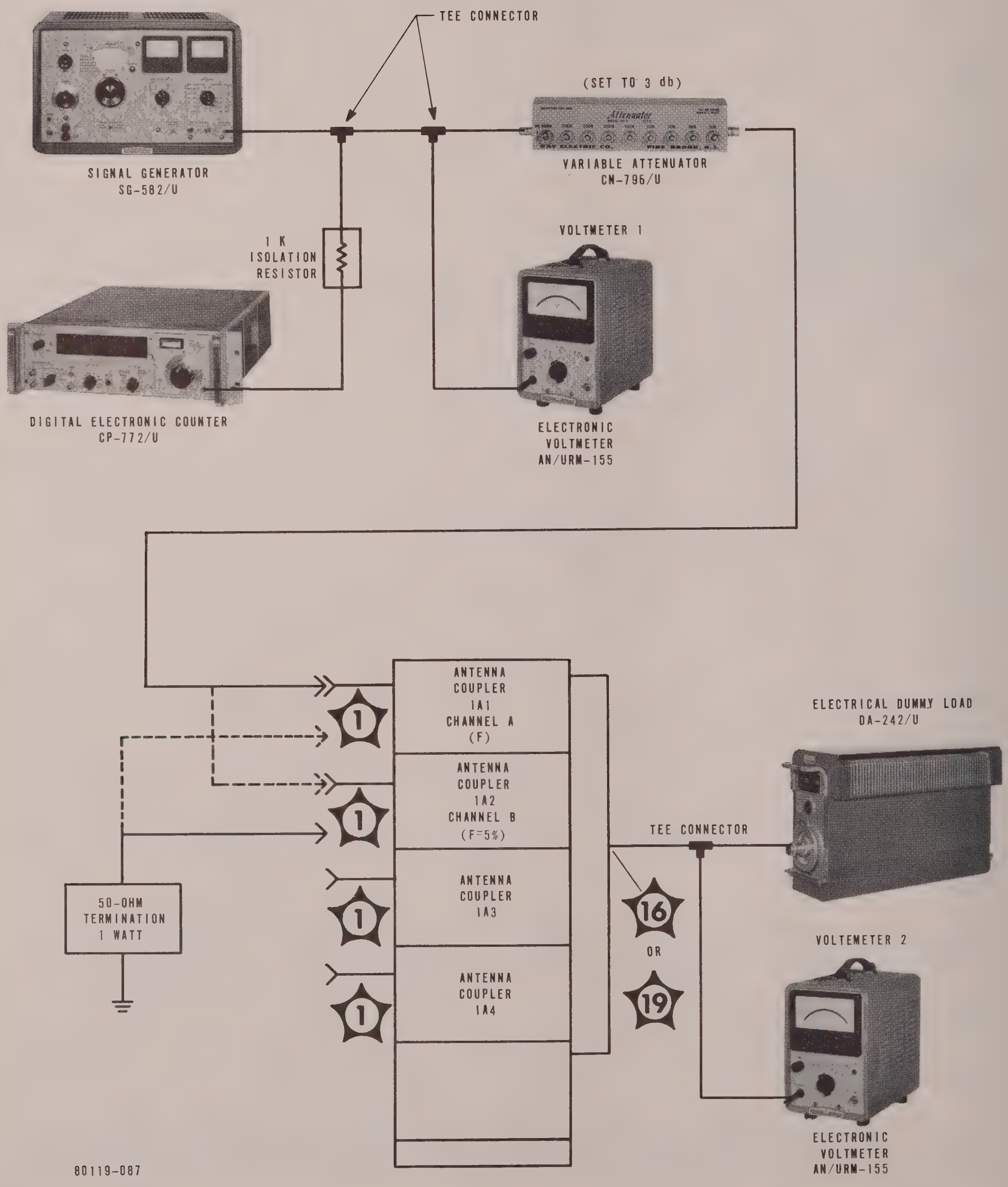

TEE CONNECTOR
(SET TO 3 db)
SIGNAL GENERATOR
SG-582/U
VARIABLE ATTENUATOR
CN-796/U
1 K
ISOLATION
RESISTOR
VOLTMETER 1
DIGITAL ELECTRONIC COUNTER
CP-772/U
ELECTRONIC
VOLTMETER
AN/URM-155
ANTENNA
COUPLER
1A1
CHANNEL A
(F)
ANTENNA
COUPLER
1A2
CHANNEL B
(F=5%)
ANTENNA
COUPLER
1A3
ANTENNA
COUPLER
1A4
1
1
1
1
ELECTRICAL DUMMY LOAD
DA-242/U
TEE CONNECTOR
16
OR
19
VOLTEMETER 2
50-OHM
TERMINATION
1 WATT
ELECTRONIC
VOLTMETER
AN/URM-155
80119-087

Figure 5-9 Test Setup 2 for Measurement of Isolation

TABLE 5-14 SAMPLE DATA SHEET FOR MEASUREMENT OF ISOLATION

Antenna Coupler Group AN/SRA-_________ Date ________________

Equipment Cabinet Serial Number_______________

Dummy Load Serial Number____________________

ITEM	TEST FREQUENCIES					
	LOWER		MIDDLE		UPPER	
	F_1	$F_1 \pm 5\%$	F_2	$F_2 \pm 5\%$	F_3	$F_3 \pm 5\%$
ISOLATION BETWEEN ANTENNA COUPLERS						
Channel Designation	A	B	A	B	A	B
Antenna Couplers	1A__	1A__	1A__	1A__	1A__	1A__
Serial Number						
Measurement Frequency (F, F+5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F+5%						
Attenuation at F+5% (interaction)						
Isolation						
Measurement Frequency (F, F-5%)						
FREQ ADJUST INPUT Dial						
FREQ ADJUST OUTPUT Dial						
OUTPUT COUPLING Dial						
Attenuation at F-5%						
Attenuation at F-5% (interaction)						
Isolation						

Remarks____

____

Step 17. Disconnect the test equipment as shown in figure 5-9 and connect the test equipment as shown in figure 5-10. Connect signal generator directly to the input of channel B and voltmeter 2 to the input of channel A.

Step 18. Set the signal generator to 5 percent above center test frequency (F1 + 5% in table 5-13) and adjust signal generator output level to obtain an indication of 1 volt on voltmeter 1; maintain this voltage through step 20. Note the indication on voltmeter 2.

Step 19. Set the variable attenuator to 60 db and connect the test equipment so that the signal generator is connected to voltmeter 2 and 50-ohm load through the variable attenuator.

Step 20. Adjust the variable attenuator until the voltage indicated on voltmeter 2 is the same as that in step 18. Record the value of attenuation indicated on the variable attenuator as isolation in the data sheet, table 5-14. This value must be greater than 35 db.

Step 21. Repeat steps 7 through 20 using the 5 percent below center test frequency (F1 - 5%) in table 5-13 in place of the 5 percent above center test frequency.

Step 22. Repeat steps 3 through 21 using the middle, center test frequency F2 in table 5-13 in place of the lower center test frequency F1.

Step 23. Repeat step 3 through 21 using the upper, center test frequency F3 in table 5-13 in place of lower center test frequency F1.

Step 24. Disconnect all test equipment and secure antenna couplers in accordance with paragraph 3.3.2.5.

Step 25. Designate the channel associated with antenna coupler 1A2 as channel A and the channel associated with antenna coupler 1A3 as channel B, and repeat steps 3 through 24.

Step 26. Designate the channel associated with antenna coupler 1A3 as channel A and the channel associated with antenna coupler 1A4 as channel B, and repeat steps 3 through 24.

Step 27. Designate the channel associated with antenna coupler 1A4 as channel A and the channel associated with antenna coupler 1A1 as channel B, and repeat steps 3 through 24.

Step 28. For an eight-channel configuration, repeat steps 1 through 27 for the second antenna coupler group.

5.2.2 Alignment and Adjustment

The alignment and adjustment procedures for Antenna Coupler Groups AN/SRA-56, -57, and -58 are required to ensure optimum performance after preventive or corrective maintenance has been performed. Most of these procedures are necessary after repair or replacement of certain critical assemblies or components, but they may also be required when reference standards measurements indicate a deterioration of performance due to a misalignment or maladjustment of the individual items covered by these procedures.

Since the performance of the antenna coupler groups depends critically upon the proper alignment and adjustment of these individual items, make every effort to ensure that the procedures that follow are performed correctly and that all minimum standards and tolerances demanded by these procedures are met. Unless specifically noted, the procedures are identical for all antenna couplers and coupler groups.

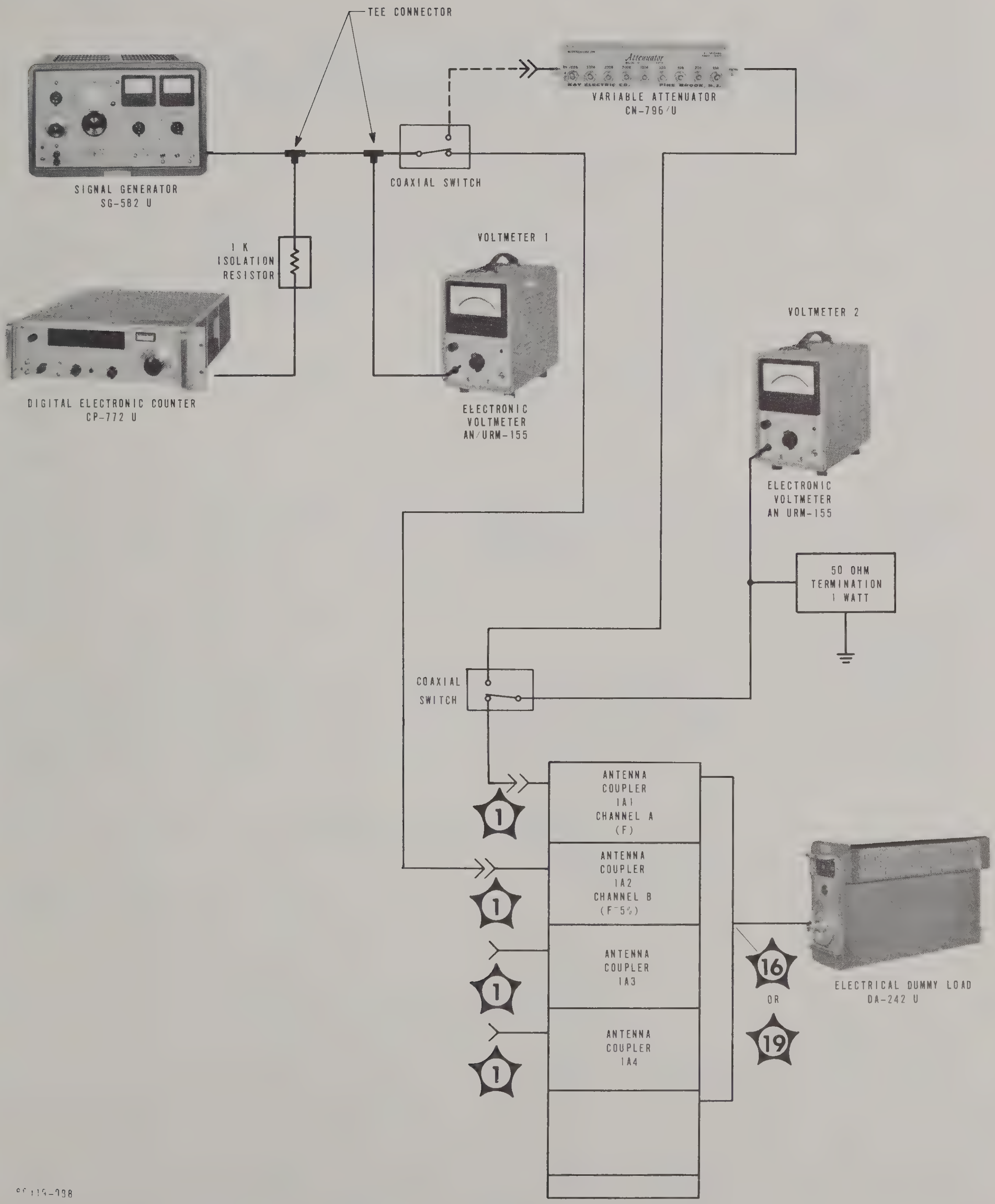

TEE CONNECTOR
VARIABLE ATTENUATOR
CN-796/U
SIGNAL GENERATOR
SG-582/U
COAXIAL SWITCH
VOLTMETER 1
1 K
ISOLATION
RESISTOR
DIGITAL ELECTRONIC COUNTER
CP-772/U
ELECTRONIC
VOLTMETER
AN/URM-155
VOLTMETER 2
ELECTRONIC
VOLTMETER
AN/URM-155
50 OHM
TERMINATION
1 WATT
COAXIAL
SWITCH
ANTENNA
COUPLER
1A1
CHANNEL A
(F)
ANTENNA
COUPLER
1A2
CHANNEL B
(F-5%)
ANTENNA
COUPLER
1A3
ANTENNA
COUPLER
1A4
1
1
1
1
16
OR
19
ELECTRICAL DUMMY LOAD
DA-242/U
115-038

Figure 5-10 Test Setup 3 for Measurement of Isolation

5.2.2.1 Test Equipment

The test equipment required for the alignment and adjustment procedures is summarized in table 5-15. Equivalent test equipment may be substituted for any item in the table provided such test equipment has characteristics identical to those of the specific items as used in the individual procedure.

TABLE 5-15. TEST EQUIPMENT FOR ALIGNMENT AND ADJUSTMENT PROCEDURES

EQUIPMENT	TYPE	DUMMY LOAD CAL.	REFLECT CAL.	GEAR ASS'Y ALIGN	RF ALIGN
Transmitter, 1 kw	On Board 2-30 MC		1		
Receiver	On Board 2-30 MC	1			
Impedance Bridge	AN/URM-39	1			
Electronic Voltmeter	AN/URM-155			2	1
Digital Electronic Counter	CP-772/U	1		1	1
Electrical Dummy Load	DA-233/U	1			
Electrical Dummy Load	DA-242/U	1			
Multimeter	ME-303/U		1		
Signal Generator	SG-582/U	1		1	1
Digital Voltmeter	Digitec 202		2		
Termination, 50-ohm	Microlab/FRX TA-5MN				1
Probe Coaxial "T" Connector	HP-11042A		1		
Resistor, 1 K Fixed, Shielded		1		1	1
Power Supply +35 vdc, 0.4 amp					1
Reflectometer Test Set	Special		1		
Precision Dummy Load	Special	1	1		
Test Cover	Special			1	1
RF Cables and Adaptors		As req	As req	As req	As req

5.2.2.2 Special Test Assemblies

A special test cover, a special test set, and a special high-power precision dummy load are required for the alignment and adjustment procedures. The test cover is used in the measurement of antenna coupler rf characteristics, and the test set and high-power precision dummy load are used in the alignment of the tune and operate reflectometers.

5.2.2.2.1 Test Covers

The test cover permits access to the resonator inductors and capacitors during the measurement of certain critical rf circuit parameters. The test cover contains inductive loops and capacitive probes. Fabrication details are shown in figure 5-11.

5.2.2.2.2 Reflectometer Test Set

This test set provides correct loads and provisions for connecting voltmeters to aid in the alignment of the tune and reflectometer power monitoring circuits. A suggested physical configuration of the test set is shown in figure 5-12; a schematic diagram of the test set is shown in figure 5-13.

5.2.2.2.3 High-Power Precision Dummy Load

This special dummy load provides a precise termination for the tune and operate reflectometers during the reflectometer alignment procedures. The dummy load is fabricated from a standard electrical dummy load DA-242/U, rf connectors, and rf cables assembled in a special configuration and calibrated to ensure its accuracy.

5.2.2.2.3.1 Fabrication Details

The fabrication details and a typical list of material required for a precision dummy electrical load are shown in figure 5-14. The exact configuration required cannot be specified since the electrical characteristics of the basic DA-242/U type electrical dummy load will vary slightly. After assembling the precision electrical dummy load configuration, follow the calibration procedures in paragraph 5.2.2.2.3.3 to ensure that the dummy load presents the required characteristics.

5.2.2.2.3.2 Calibration Test Equipment and Test Setup

The test equipment required to calibrate the precision dummy load is listed below; the test setup required is shown in figure 5-15.

a. One signal generator, SG-582/U

b. One digital electronic counter, CP-772/U

c. One electrical dummy load, DA-233/U

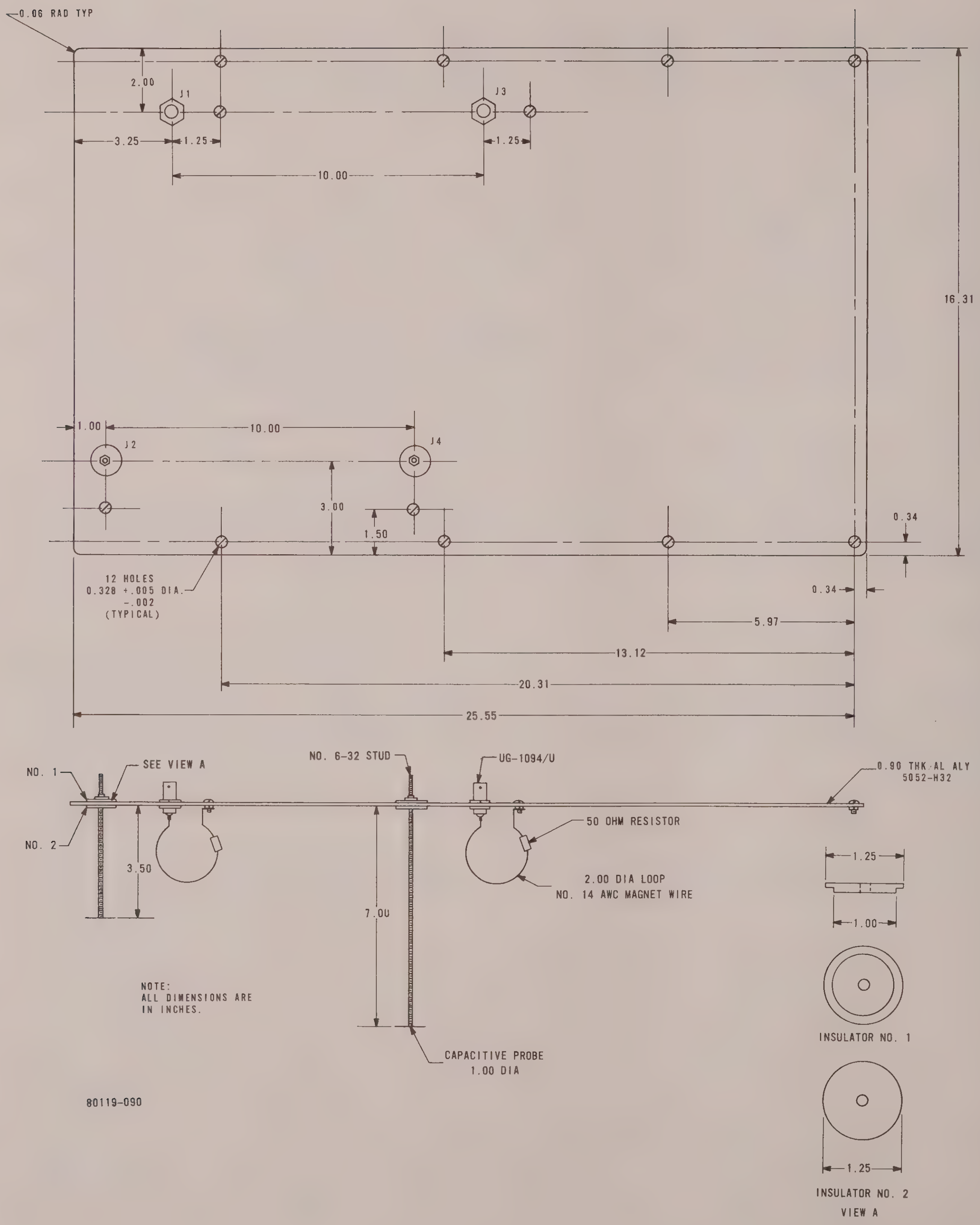
d. One electrical dummy load, DA-242/U

e. One impedance bridge, AN/URM-39

f. One rf detector, on board receiver, 2 to 30 mc

g. One resistor, 1 K, fixed, shielded

h. RF cable and connector fittings, as required


0.06 RAD TYP
2.00
J1
J3
3.25
1.25
1.25
10.00
16.31
1.00
10.00
J2
J4
3.00
1.50
0.34
12 HOLES
0.328 +.005 DIA.
-.002
(TYPICAL)
0.34
5.97
13.12
20.31
25.55
NO. 1
SEE VIEW A
NO. 6-32 STUD
UG-1094/U
0.90 THK AL ALY
5052-H32
NO. 2
50 OHM RESISTOR
3.50
2.00 DIA LOOP
NO. 14 AWC MAGNET WIRE
7.00
1.25
1.00
INSULATOR NO. 1
CAPACITIVE PROBE
1.00 DIA
1.25
INSULATOR NO. 2
VIEW A

NOTE:
ALL DIMENSIONS ARE
IN INCHES.

80119-090

Figure 5-11 Special Test Covers, Fabrication Details

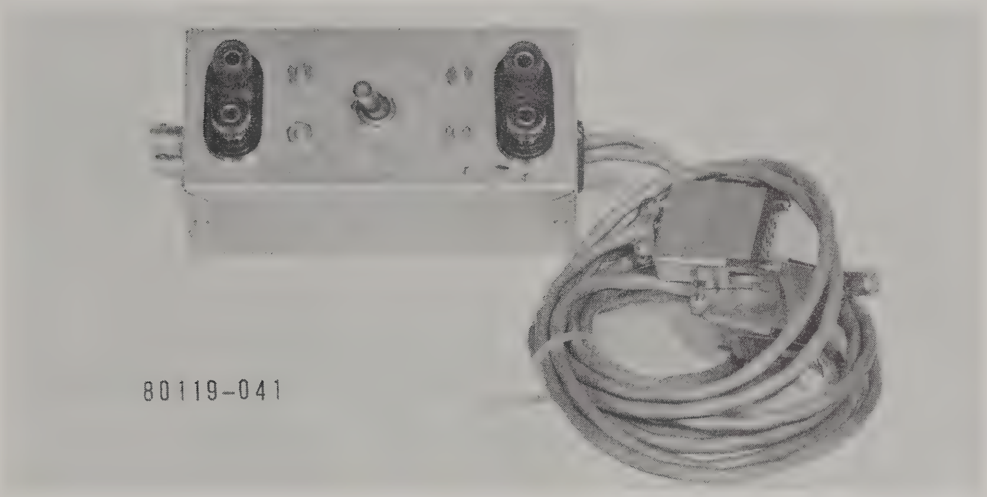


Figure 5-12 Reflectometer Test Set, Suggested Physical Configuration

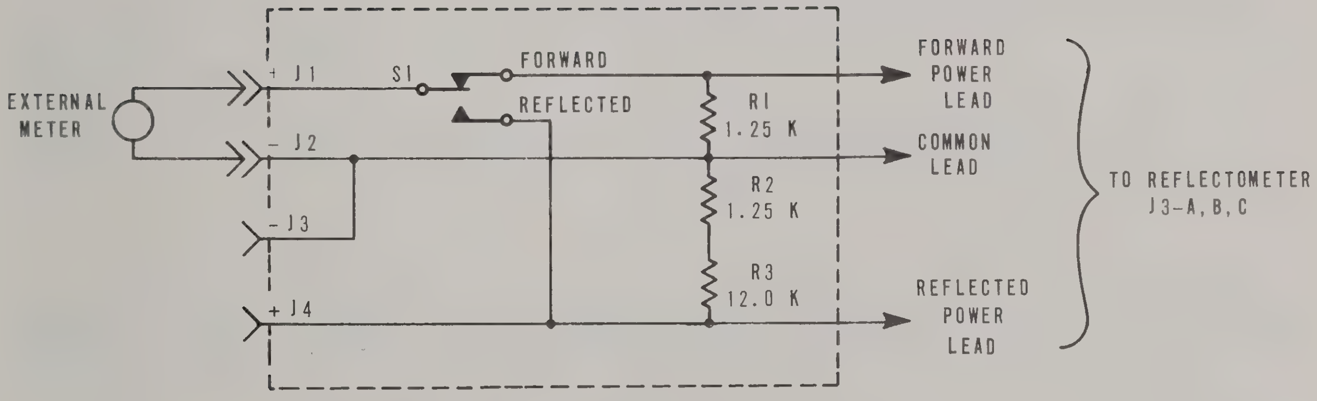

EXTERNAL METER
+ J1
S1
FORWARD
REFLECTED
- J2
- J3
+ J4
R1 1.25 K
R2 1.25 K
R3 12.0 K
FORWARD POWER LEAD
COMMON LEAD
REFLECTED POWER LEAD
TO REFLECTOMETER J3-A, B, C
80119-091

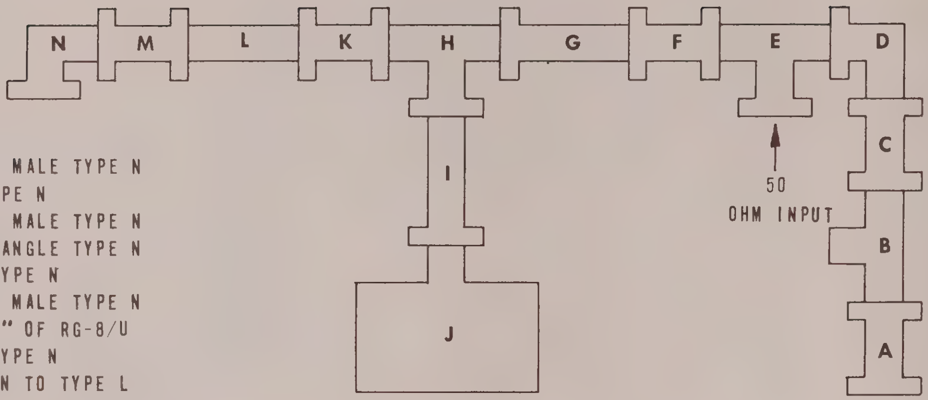
Figure 5-13 Reflectometer Test Set, Schematic Diagram

5.2.2.2.3.3 Calibration Procedures

The following procedures must be performed prior to using the precision dummy load in the alignment of the tune and operate reflectometers.

Step 1. Assemble the precision dummy load as shown in figure 5-14.

Step 2. Connect the test equipment as shown in figure 5-15 with the electrical dummy load (DA-233/U) connected to the impedance bridge through an N-adaptor and cable as short as possible.

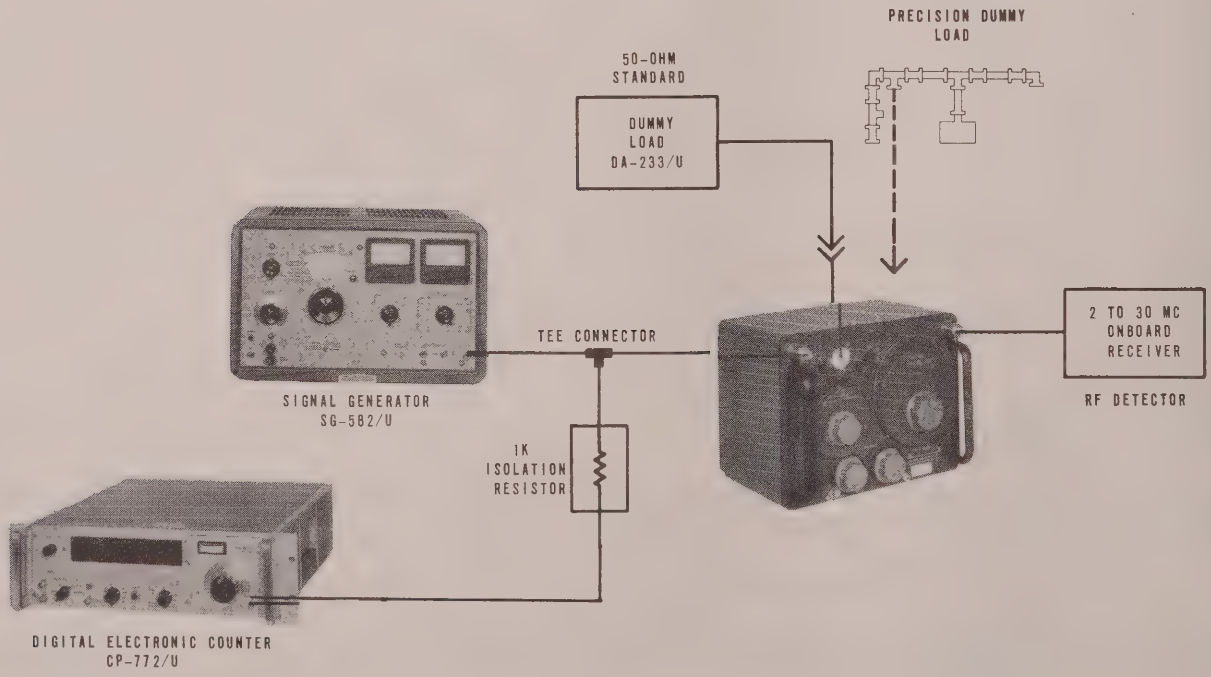

N
M
L
K
H
G
F
E
D
C
B
A
I
J
50
OHM INPUT

A. UG-57B/U DOUBLE MALE TYPE N
B. UG-28A/U TEE TYPE N
C. UG-57B/U DOUBLE MALE TYPE N
D. UG-27B/U RIGHT ANGLE TYPE N
E. UG-107A/U TEE TYPE N
F. UG-57B/U DOUBLE MALE TYPE N
G. CABLE, 4'-6-1/4" OF RG-8/U
H. UG-107A/U TEE TYPE N
I. UG-999A/U TYPE N TO TYPE L
J. 2500 WATT 50 OHM NOMINAL LOAD, BIRD ELECTRONIC CORP., TERMALINE MODEL 8890,
K. UG-57B/U DOUBLE MALE TYPE N
L. UG-29A/U DOUBLE FEMALE TYPE N
M. UG-57B/U DOUBLE MALE TYPE N
N. UG-27B/U RIGHT ANGLE TYPE N

ADJUSTMENT OF THE HIGH POWER LOAD TO (50 + j0) OHMS AT 30 MC

80119-092

Figure 5-14 Precision Dummy Load, Fabrication Details


PRECISION DUMMY LOAD
50-OHM STANDARD
DUMMY LOAD DA-233/U
TEE CONNECTOR
SIGNAL GENERATOR SG-582/U
1K ISOLATION RESISTOR
2 TO 30 MC ONBOARD RECEIVER
RF DETECTOR
DIGITAL ELECTRONIC COUNTER CP-772/U

80119-093

Figure 5-15. Test Setup for Calibration of Precision Dummy Load

Step 3. Adjust the signal generator frequency to 30.0 mc using the digital electronic counter to obtain the precise frequency.

Step 4. On the signal generator, rotate MODULATION AMPLITUDE/MODULATION SELECTOR switch to INT/1000~to obtain a 1-kc audio tone.

Step 5. Tune the rf detector to 30.0 mc using the 1-kc audio tone.

Note

> Turn off the digital electronic counter to eliminate any interference with balancing operations.

Step 6. On the impedance bridge, rotate the OHMS/RESISTANCE dial to 50 and the OHMS/REACTANCE dial to 100.

Step 7. With the bridge UNKNOWN terminal shorted, adjust the two INITIAL BALANCE controls as required to null out the 1-kc audio tone. Lock the INITIAL BALANCE controls.

Step 8. Disconnect the electrical dummy load (DA-233/U) and connect the input port of the high-power precision dummy load to the impedance bridge.

Step 9. Null the impedance bridge by adjusting the OHMS/RESISTANCE and OHMS/REACTANCE dials as required. Record the OHMS/RESISTANCE dial indication as R and the OHMS/REACTANCE dial indication as X_D.

Step 10. Calculate the reactance X from the dial indication X_D obtained in step 9 and the formula:

$$X = \frac{X_D - 100}{30}$$

Step 11. If the value of R in step 9 is between 49.7 and 50.3 ohms and the value of X is between +0.3 and -0.3 ohms, the precision dummy load is acceptable by itself without requiring further correction. If the value of R or X are not within these acceptable elements, proceed with step 12.

Step 12. Add or subtract UG-type connectors on the high-power precision dummy load, and repeat steps 9 through 11 until the values of R and X are within acceptable limits.

Step 13. Make a sketch of the configuration and record the serial number of the electrical dummy load used so that future assembling of a precision electrical dummy load may be expedited when required.

Note

> The sketch should only be used as a guide and not to replace the requirement to measure the actual precision electrical load characteristics at the future date.

Step 14. Disconnect all test equipment.

5.2.2.3 Alignment and Adjustment Procedures

The following procedures establish the correct operating points for all adjustable components and devices in the antenna coupler groups. Normally, these procedures are required after repair or replacement of certain critical assemblies or components. However, these procedures may also be required when preventive maintenance indicates that the adjustable components in devices have become misaligned due to mishandling or abuse of the equipment.

The procedures that follow cover the alignment of the operate and tune reflectometers, alignment of gear assemblies and frequency indicator tapes of the tuning controls for the input and output resonators, adjustment of the tuning capacitor spark gaps, and alignment of the rf section of the antenna couplers.

All of the alignment and adjustment procedures are performed on the work bench; do not attempt to perform these procedures with equipment mounted in the equipment cabinet. The procedures are designed to restore the equipment to original factory specifications. Perform all procedures carefully, and troubleshoot or reject any assembly, component, or device that fails to meet the minimum standards or tolerance set forth under the individual procedure.

5.2.2.3.1 Operate Reflectometer

Before a replacement or repaired operate reflectometer is installed in a coupler group, it must be aligned in accordance with the following procedure. Failure to align the reflectometer properly may result in loss of protection from excessive vswr, activation of excessive vswr protective devices at "safe" levels of reflected power, or erroneous indications of forward or reflected power on the RF POWER meters of the associated antenna coupler.

5.2.2.3.1.1 Test Equipment and Test Setup

The test equipment required to align the operate reflectometer is listed below; the test setup required is shown in figure 5-16.

a. One rf power source, on board transmitter, 2 to 30 mc, 1 kw average power

b. One multimeter, ME-303/U

c. Two digital voltmeters, Digitec Model 201

d. One probe coaxial "T" connector, HP-11042A

e. One reflectometer test set, special (see paragraph 5.2.2.2.2)

f. One high-power, precision dummy load, special (see paragraph 5.2.2.2.3)

5.2.2.3.1.2 Alignment Procedures

Perform the following bench procedures just prior to installing the operate reflectometer in the equipment cabinet. The procedures are identical for all operate reflectometers in all three groups.

WARNING

Exercise extreme care in performing these procedures. When connected to the transmitter, the operate reflectometer contains high rf voltages that may be harmful or fatal if contacted.

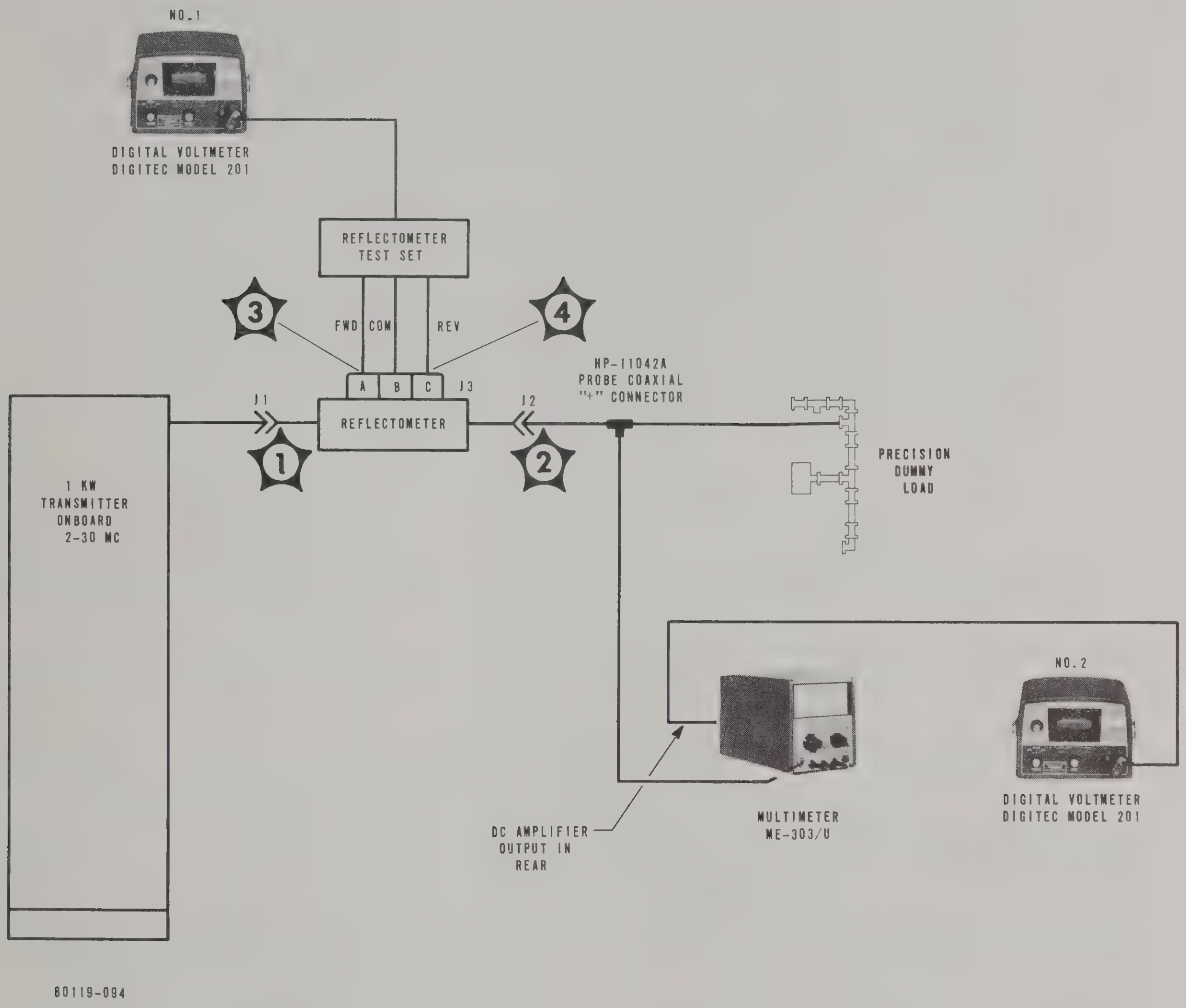

NO. 1
DIGITAL VOLTMETER
DIGITEC MODEL 201
REFLECTOMETER
TEST SET
③
④
FWD
COM
REV
A
B
C
J3
J1
J2
REFLECTOMETER
HP-11042A
PROBE COAXIAL
"+" CONNECTOR
①
②
PRECISION
DUMMY
LOAD
1 KW
TRANSMITTER
ONBOARD
2-30 MC
NO. 2
MULTIMETER
ME-303/U
DIGITAL VOLTMETER
DIGITEC MODEL 201
DC AMPLIFIER
OUTPUT IN
REAR
80119-094

Figure 5-16. Test Setup for Alignment of Reflectometers

Step 1. Remove the cover from the reflectometer, turn the cover over, and replace on the reflectometer as shown in figure 5-17. Secure the cover with the four retaining screws.

Step 2. Connect the test equipment as shown in figure 5-16 so that the transmitter is connected to 1A6A-J1 (input), the high-power precision dummy load and probe coaxial "T" connector to 1A6A-J2 (output), and the reflectometer test set to 1A6A-J3.

Step 3. Rotate RANGE switch on multimeter to 500 V; rotate RANGE switch on digital voltmeters 1 and 2 to 1.000.

CAUTION

Do not apply rf power to the reflectometer that may cause voltmeter 2 to exceed 0.900 volts. Voltages greater than this may damage the voltmeter.

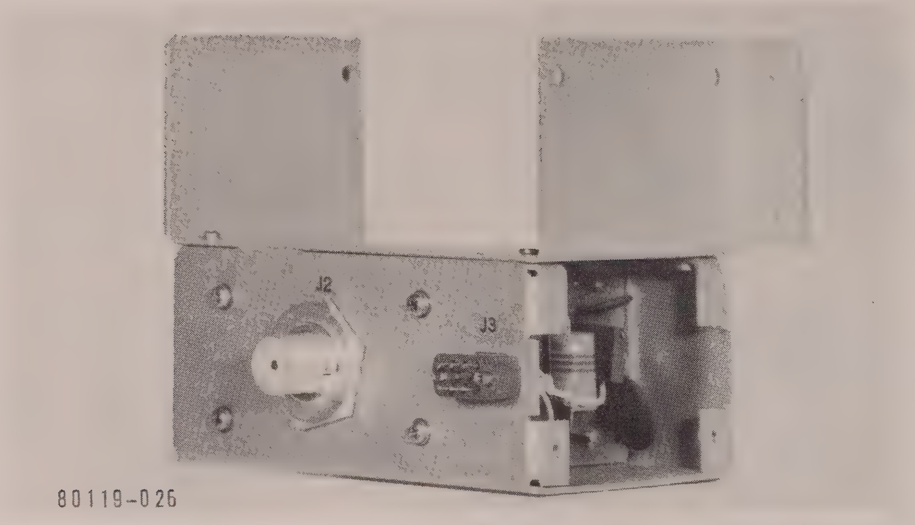


Figure 5-17. Placement of Cover for Alignment of Reflectometers

Step 4. Set switch S1 on reflectometer test set to monitor the REFLECTED power circuit of the reflectometer.

Step 5. Set the transmitter to 30.0 mc. Tune and load the transmitter in accordance with applicable technical manual.

Step 6. Bring the transmitter power up to 1 kw by adjusting the transmitter output until digital voltmeter 2 indicates 0.662.

Step 7. On reflectometer, rotate capacitor A2C2 until digital voltmeter 1 nulls (see figure 5-18 for location of A2C2).

Step 8. Place the transmitter in standby, and reverse the test equipment connected to receptacles 1A6-J1 and 1A6-J2. Connect transmitter to J2 and precision dummy load to J1.

Step 9. Set switch S1 on reflectometer test set to monitor the FORWARD power circuit of the reflectometer.

Step 10. Energize the transmitter, and adjust the transmitter output power until voltmeter 2 indicates 0.662 volts.

Step 11. On reflectometer, rotate capacitor A1C2 (figure 5-18) until voltmeter 1 nulls.

Step 12. Adjust transmitter output power until voltmeter 2 indicates 0.336 volts.

Step 13. Rotate RANGE switch on voltmeter 1 to 10.0.

Step 14. Set switch S1 on test set to monitor the REFLECTED power circuit of the reflectometer.

Step 15. On reflectometer, rotate potentiometer A2R2 until digital voltmeter 1 indicates 1.300 volts.

Step 16. Place transmitter in standby, and reverse the test equipment connected to J1 and J2. Connect transmitter to J1 and precision dummy load to J2.

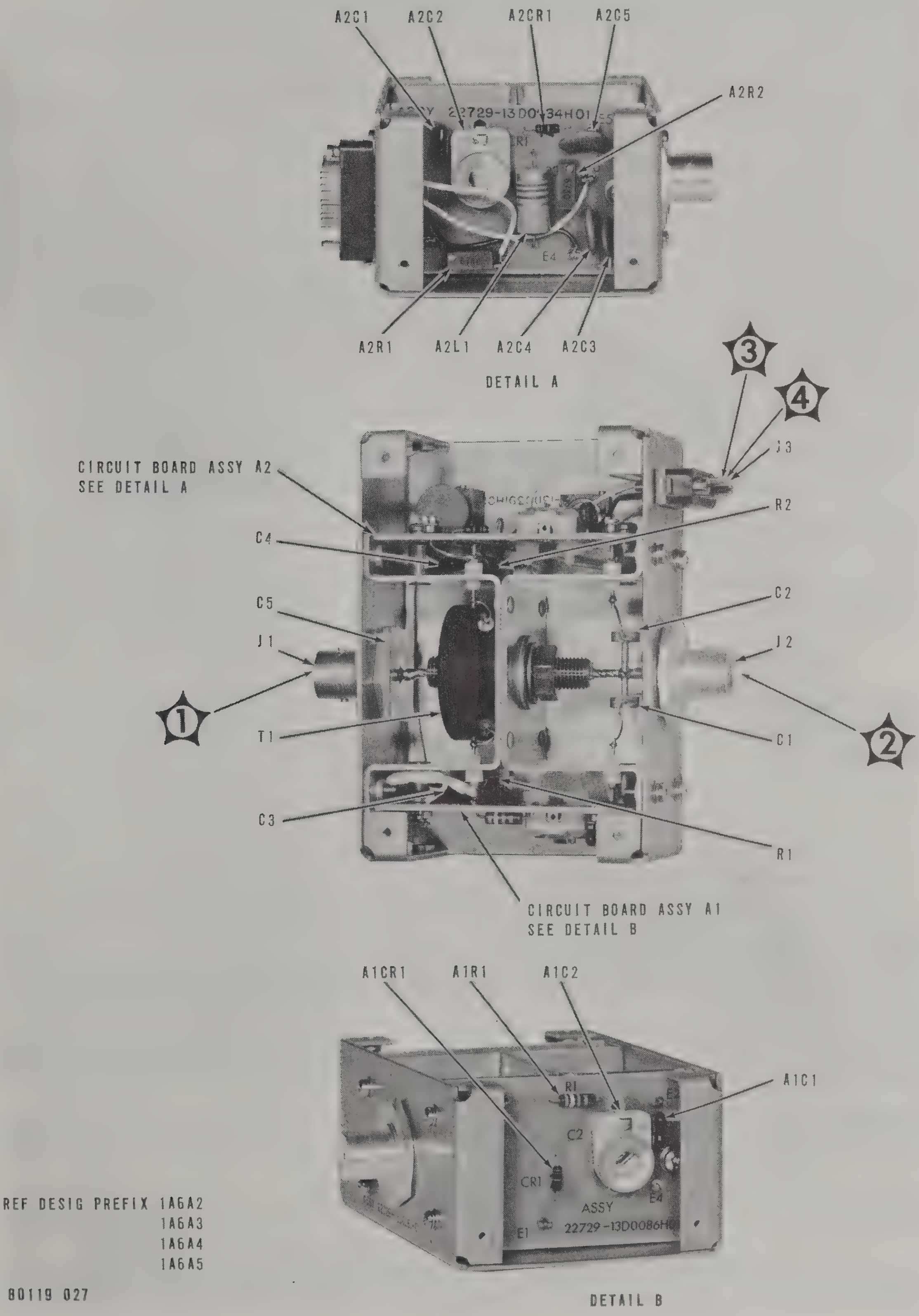

A2C1
A2C2
A2CR1
A2C5
A2R2
A2R1
A2L1
A2C4
A2C3
DETAIL A
③
④
J3
CIRCUIT BOARD ASSY A2
SEE DETAIL A
R2
C4
C2
C5
J1
J2
①
T1
C1
②
C3
R1
CIRCUIT BOARD ASSY A1
SEE DETAIL B
A1CR1
A1R1
A1C2
A1C1
REF DESIG PREFIX 1A6A2
1A6A3
1A6A4
1A6A5
80119 027
DETAIL B

Figure 5-18. Operate Reflectometer, Location of Adjustments and Components

Step 17. Energize transmitter and adjust transmitter output power until voltmeter 2 indicates 0.622 volts.

Step 18. Set switch S1 on test set to monitor the FORWARD power circuit of the reflectometer. Rotate RANGE switch on voltmeter 1 to 1.000.

Step 19. On reflectometer, rotate potentiometer A2R1 until voltmeter 1 indicates 0.100 volts.

Step 20. Shut down the transmitter and disconnect all test equipment.

Step 21. Replace cover on reflectometer in its normal position and mark the reflectometer as "calibrated".

5.2.2.3.2 Tune Reflectometer

Before a replacement or repaired tune reflectometer is installed in a coupler group, it must be aligned in accordance with the following procedure. Failure to align the reflectometer properly may result in erroneous indication on the RF POWER REFLECTED meter during the loading of an antenna coupler, resulting in poor operating performance.

5.2.2.3.2.1 Test Equipment and Test Setup

The test equipment and test setup for aligning the tune reflectometer are the same as those used for the operate reflectometer (see paragraph 5.2.2.3.1.1).

5.2.2.3.2.2 Alignment Procedures

Perform the following bench procedures just prior to installing the tune reflectometer in the equipment cabinet. These procedures are identical for the tune reflectometer in all three coupler groups.

WARNING

> Exercise extreme care in performing these procedures. When connected to the transmitter, the tune reflectometer contains high rf voltages that may be harmful or fatal if contacted.

Step 1. Remove the cover from the reflectometer, turn the cover over, and replace on the reflectometer as shown in figure 5-17. Secure the cover with the four retaining screws.

Step 2. Connect the test equipment as shown in figure 5-16 so that the transmitter is connected to receptacle 1A6A6J1 (input) and the precision dummy load to receptacle 1A6A6J2 (output) and the reflectometer test set to receptacle 1A6A6J3.

Step 3. Rotate RANGE switch on multimeter to 150 V. Rotate RANGE switch on voltmeter 1 to 1.000 and RANGE switch on voltmeter 2 to 10.00.

Step 4. Set switch S1 on the test set to monitor the REFLECTED power circuit of the tune reflectometer.

Step 5. Set the transmitter frequency to 30.0 mc. Tune and load the transmitter using a power output of approximately 20 watts in accordance with applicable technical manual.

Step 6. Adjust the transmitter power to 20 watts by adjusting the transmitter output until digital voltmeter 2 indicates 1.000 volts.

Step 7. On the reflectometer, rotate capacitor A1C2 until digital voltmeter 1 nulls (see figure 5-19 for location of A1C2).

Step 8. Shut down the transmitter and disconnect all test equipment.

Step 9. Replace cover on reflectometer in its normal position, and mark the reflectometer as "calibrated".

5.2.2.3.3 Capacitor Drive Assemblies

Whenever the gear assembly for the input or output tuning controls must be removed during several of the repair procedures, it must be realigned in accordance with the following procedures. This is necessary to ensure that the gear assembly does not drive the tuning capacitor beyond its stops and that the frequency indicating tape displays the correct resonant frequency of the resonator.

5.2.2.3.3.1 Test Equipment and Test Setup

The test equipment required to align the capacitor drive assemblies is given below; the test setup is shown in figure 5-20.

a. One signal generator, SG-582/U

b. One digital electronic counter, CP-772/U

c. One electronic voltmeter, AN/URM-155

d. One resistor, 1-K, fixed, shielded

e. One test cover, special (see paragraph 5.2.2.2.1)

f. One power supply, 35 vdc, 0.4 amperes

5.2.2.3.3.2 Alignment Procedures

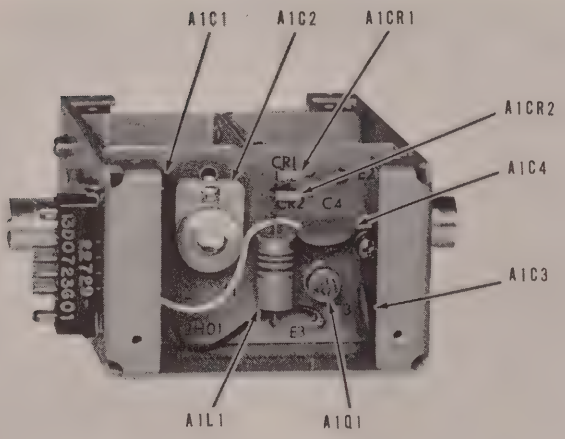
Perform all of the following procedures if the gear assembly must be realigned with the capacitor. Perform only the steps specified by the note if only the tape must be realigned because it has slipped on the drive mechanism.

Step 1. Remove antenna coupler from equipment cabinet and place on work bench (see paragraph 5.3.1.1 for removal procedures).

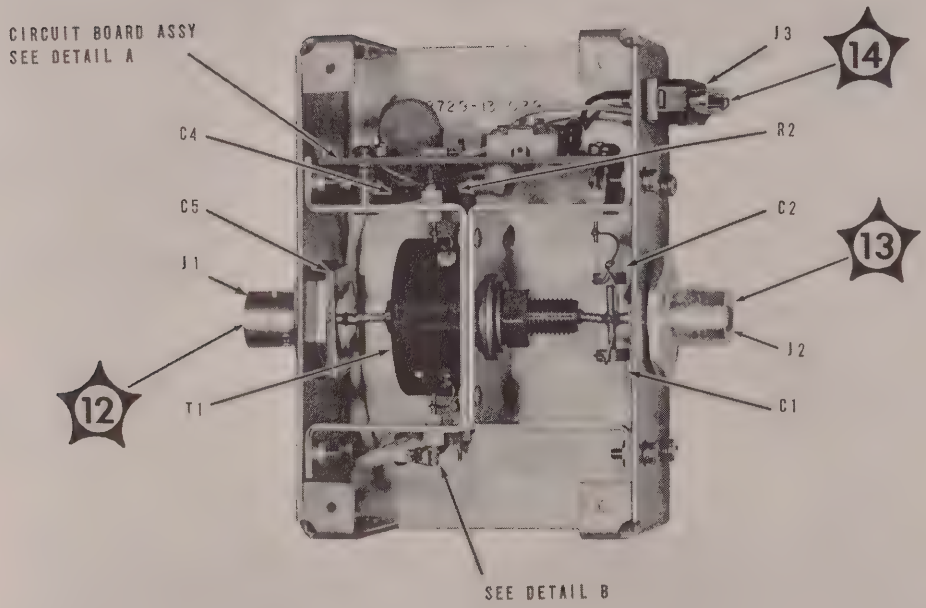
Step 2. Remove front panel from antenna coupler (see paragraph 5.3.1.6). Replace all control knobs.

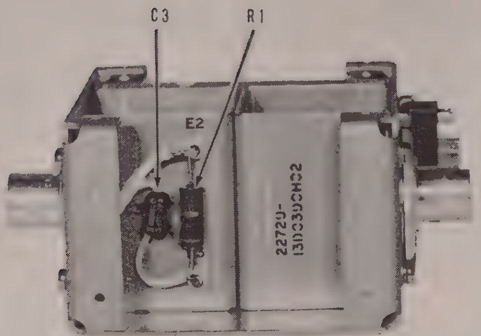
Note

If the tape has slipped, but the gear assembly is still aligned with the capacitor, proceed with step 9. Do not perform steps 3 through 8.


A1C1
A1C2
A1CR1
A1CR2
A1C4
A1C3
A1L1
A1Q1

DETAIL A


CIRCUIT BOARD ASSY
SEE DETAIL A
J3
14
C4
R2
C5
C2
13
J1
J2
12
T1
C1
SEE DETAIL B



REF DESIG PREFIX 1A6A6

80119-028

DETAIL B

Figure 5-19. Tune Reflectometer, Location of Adjustment and Components

Step 3. Remove tuning capacitor gear drive assembly (see paragraph 5.3.1.8).

Step 4. Replace control knob on shaft of gear assembly.

Step 5. For gear assemblies used on antenna couplers CU-1772/SRA-56 (2 to 6 mc) or CU-1776/SRA-58 (10 to 30 mc), rotate control knob fully clockwise to the stop. For gear assemblies used on antenna coupler CU-1774/SRA-57 (4 to 12 mc) rotate control knob fully counterclockwise to the stop.

Step 6. Install frequency indicating tape on tape drive mechanism.

Step 7. For gear assemblies used on antenna coupler CU-1772/SRA-56, rotate the control knob 3 complete revolutions counterclockwise, set the tap at 6.4 mc, and rotate the control knob counterclockwise until 6.0 mc on the tape is centered on the tape drive mechanism. For gear assemblies used on antenna coupler CU-1774/SRA-57, rotate the control knob 1 complete revolution clockwise and set the tape at 3.9 mc, and rotate the control clockwise until 12.0 mc is centered on the tape drive mechanism. For gear assemblies used on antenna coupler CU-1776/SRA-58, rotate the control knob 5 complete revolutions counterclockwise, set the tape at 32.0 mc, and rotate control knob counterclockwise until 24.0 mc on the tape is centered on the tape drive mechanism.

Step 8. If the gear assembly is used with the input resonator tuning capacitor, proceed with step 9. If it is used with the output resonator tuning capacitor, perform steps 8a through 8e given below:

a. On the antenna coupler remove the top cover, and place a shorting strap across the input resonator tuning capacitor C3 (see figure 5-36 for location of C3).

b. Connect the 35-volt dc power supply between pin H (+) and pin T (-) on antenna coupler receptacle J1.

c. Rotate OUTPUT COUPLING control counterclockwise to the stop.

d. Operate EMERGENCY-ON/OFF switch to ON.

e. Rotate TUNE/OPERATE switch to the TUNE-2 position, and ensure that automatic decoupling switch solenoid A5K1 energizes to remove the short from output resonator tuning capacitor C4.

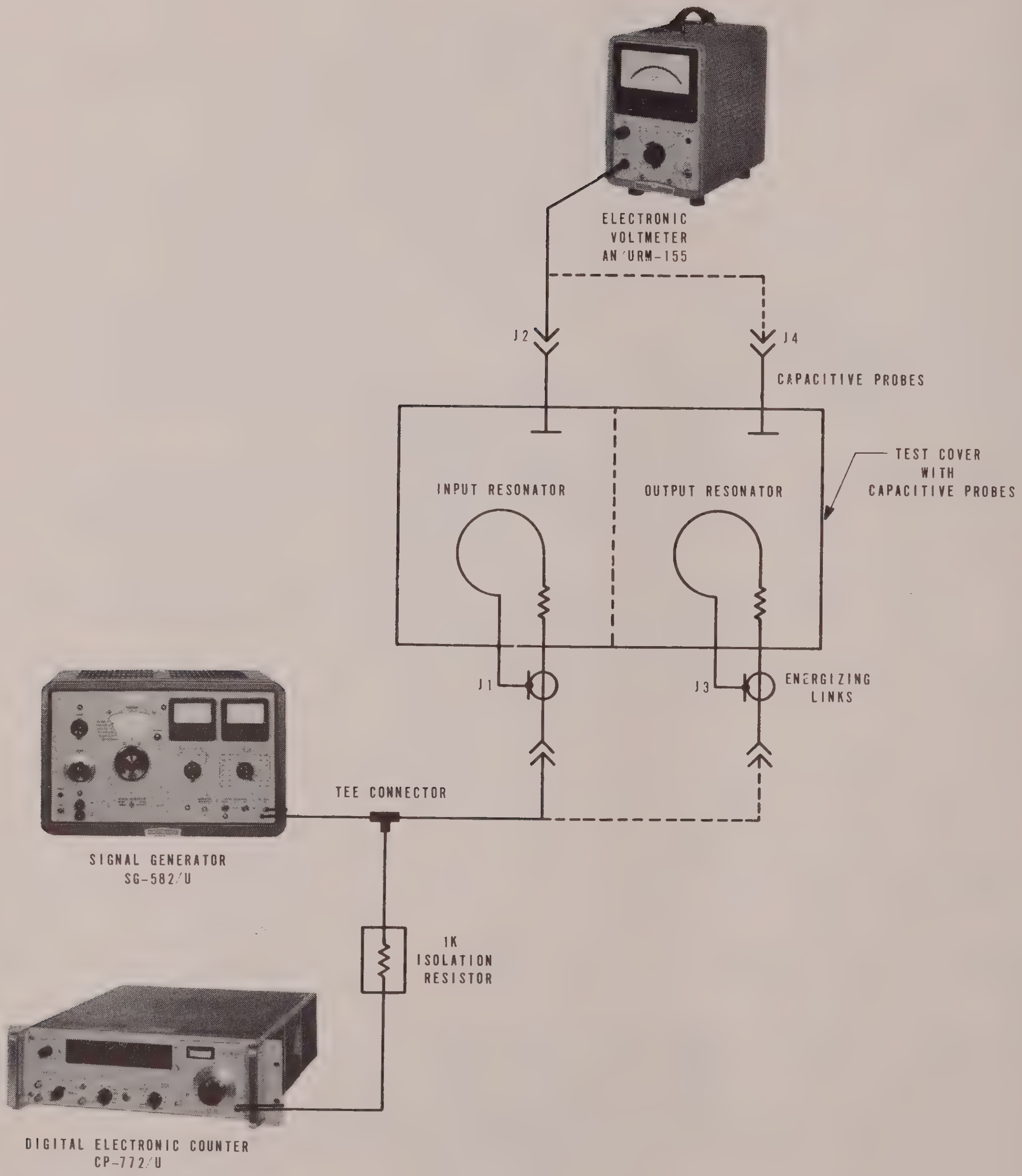
Step 9. Replace the top cover with special test cover (see paragraph 5.2.2.2.1). Secure all fasteners.

Step 10. Connect test equipment as shown in figure 5-20 to the resonator with which the gear assembly is to be used. Connect the signal generator to the associated energizing link and the voltmeter to the capacitive probe.

Step 11. Set the signal generator to the frequency of the tape established in step 7:

CU-1772/SRA-56; 6.00 mc
CU-1774/SRA-57; 12.00 mc
CU-1776/SRA-58; 24.00 mc

Step 12. Rotate the insulated coupling shaft connected to the tuning capacitor as required to obtain a maximum (peak) indication on the voltmeter.


ELECTRONIC
VOLTMETER
AN/URM-155
J2
J4
CAPACITIVE PROBES
TEST COVER
WITH
CAPACITIVE PROBES
INPUT RESONATOR
OUTPUT RESONATOR
J1
J3
ENERGIZING
LINKS
TEE CONNECTOR
SIGNAL GENERATOR
SG-582/U
1K
ISOLATION
RESISTOR
DIGITAL ELECTRONIC COUNTER
CP-772/U

80119-095

Figure 5-20. Test Setup for Capacitor Drive Assembly Alignment

Step 13. Install the gear assembly and mate to the dogbone. Rotate the control knob on the gear assembly clockwise if required for mating. Secure the gear assembly on the antenna coupler.

Step 14. Rotate the control knob as required to obtain a maximum indication on the voltmeter, and reset the tape to the frequency specified in step 11.

Step 15. Set the signal generator to the upper frequency limit of the resonator as given below:

CU-1772/SRA-56; 6.15 mc
CU-1774/SRA-57; 12.30 mc
CU-1776/SRA-58; 30.75 mc

Step 16. Rotate control knob clockwise to obtain a maximum (peak) indication on the voltmeter. The indication on the tape must be within 2.5 percent of the frequency specified in step 15.

Step 17. Set the signal generator to the lower frequency limit of the resonator as given below:

CU-1772/SRA-56; 1.95 mc
CU-1774/SRA-57; 3.90 mc
CU-1776/SRA-58; 9.75 mc

Step 18. Rotate control knob clockwise to obtain a maximum (peak) indication on the voltmeter. The indication on the tape must be within 2.5 percent of the frequency specified in step 17.

Step 19. If indications in steps 16 and 18 are not within specification, check the resonator for faulty components, repair or replace as required, and repeat steps 11 through 18.

Step 20. Disconnect test equipment and replace special test cover with top cover on the antenna coupler.

Step 21. Remove control knobs and replace front panel (see paragraph 5.3.1.6).

Step 22. Replace antenna coupler in equipment cabinet (see paragraph 5.3.1.1).

5.2.2.3.4 Resonator Spark Gaps

During preventive maintenance and after repair or replacement of the resonator tuning capacitors, it is necessary to check the spacing of the spark gaps on the tuning capacitors. To adjust these spark gaps, refer to figure 5-36 and perform the following steps:

Step 1. Loosen the lock units on the shaft of each spark gap device.

Step 2. Rotate the shaft of each spark gap device until the ball end is spaced 1/4 inch from the capacitor plates.

Step 3. Tighten the locknuts.

5.2.2.3.5 Antenna Coupler RF Section

The performance of an antenna coupler depends upon the characteristics of the electronic Q control, input resonator, output resonator, and interresonator coupling. The following bench procedures measure the rf characteristics, provide limits, and detail necessary adjustments to obtain optimum performance from the antenna coupler. The adjustment of interresonator coupling is one the most difficult and involved. However, in most cases requiring that these procedures be performed to reestablish proper operation, the problem area will have already been discovered and it will only be necessary to check that the proper coefficient of coupling and output resonator loaded Q's are being realized. In such cases, no actual adjustment of interresonator coupling is required.

Note

> An alternate method of adjusting interresonator coupling is contained in paragraph 5.2.2.3.5.8. This procedure, based on trial and error method, is a much simplier procedure, but requires the entire coupler group to be secured for the adjustment of a single antenna coupler. If the group can be secured for this alternate method, perform the procedures in paragraphs 5.2.2.3.5.2 through 5.2.2.3.5.5 only, and then the procedures in paragraph 5.2.2.3.5.8.

5.2.2.3.5.1 Test Equipment and Test Setup

The test equipment required to measure the rf characteristics and adjust the interresonator coupling is listed below; two test setups, shown in figures 5-21 and 5-22, are required.

a. One signal generator, SG-582/U

b. One digital electronic counter, CP-772/U

c. One electronic voltmeter, AN/URM-155

d. One 50-ohm termination, AN/URM-88

e. One resistor, 1 K, fixed, shielded

f. One power supply, 35 vdc, 0.4 amperes

g. One test cover, special (see paragraph 5.2.2.2.1)

h. RF cables and connectors, as required

5.2.2.3.5.2 Basic Measurement of Resonator Bandwidth and Q

Throughout these procedures, it is necessary to measure the bandwidth and Q of the resonators under loaded and unloaded conditions. To simplify the procedures, the basic measurement technique is described in detail in the following steps and referenced from the individual procedure.

The basic measurement procedure is the same for both input and output resonators except for the connection of test equipment, the shorting of the resonator not under test, and the controls used to tune the resonator. The connection of test equipment and the method of shorting the other resonator is given under the individual procedure; the control used is given under the basic measurement procedure.

Step 1. Ensure that the test equipment is connected properly to the correct resonator to be measured (see figure 5-21). Adjust capacitor probes on the test cover to obtain an adequate output, but do not permit the probes to touch the capacitors. To measure the characteristics of the input resonator, connect the signal generator to test cover receptacle J1 (energizing link) and the voltmeter to J2 (capacitive probe) for the input resonator. To measure the characteristics of the output resonator, connect the signal generator to test set receptacle J3 (energizing link) and voltmeter to J4 (capacitive probe) for the output resonator.

Step 2. Set the signal generator frequency to the test frequency (F_T) specified under the individual procedure.

Step 3. On antenna coupler, rotate FREQ ADJUST INPUT control (for input resonator) or FREQ ADJUST OUTPUT control (for output resonator) to obtain a maximum (peak) indication on voltmeter.

Step 4. Adjust signal generator output to obtain a 0-db indication on the voltmeter.

Step 5. Decrease the signal generator frequency below the test frequency until voltmeter indicates -3 db. Label the frequency indicated on the electronic counter as f_1.

Step 6. Increase the signal generator frequency above the test frequency until voltmeter again indicates -3 db. Label the frequency indicated on the electronic counter as f_2.

Step 7. Subtract the frequency obtained in step 5 from that obtained in step 6, and record this value as the appropriate bandwidth (BW) in the data sheet (table 5-16).

$$BW = f_2 - f_1$$

Step 8. Divide the bandwidth (BW) obtained in step 7 into the test frequency (F_T), and record this value as the appropriate Q in the data sheet.

$$Q = \frac{F_T}{BW}$$

5.2.2.3.5.3 Measurement of Input and Output Resonator Tuning Limits

As the initial step in the adjustment of interresonator coupling, perform this procedure to ensure that both resonators will tune to the required limits. If a resonator can not be tuned as required, check the resonators of the bandpass filter for defective components and the capacitor drive mechanism for damage. Repair or replace any defective item as required, and repeat the entire procedure until the resonators are within specification. When the tuning limits are acceptable, proceed to paragraph 5.2.2.3.5.4.

Step 1. Remove the antenna coupler from equipment cabinet and place on work bench (refer to paragraph 5.3.1.1 for removal procedure).

Step 2. Remove the top cover from the antenna coupler and replace with special test cover (figure 5-11). Ensure that energizing links do not touch inductors and capacitive probes do not touch capacitors. Secure all fasteners.

Step 3. Connect test equipment to the test cover as shown in figure 5-21 so that the signal generator is connected to the test cover energizing link (J1) for the input resonator and the voltmeter to the test cover capacitive probe (J2) for the input resonator. Do not connect the 50-ohm termination to antenna coupler receptacle 1A-J2.

Step 4. Rotate FREQ ADJUST INPUT control in the DECREASE direction to the stop. Rotate FREQ ADJUST OUTPUT control to mid frequency.

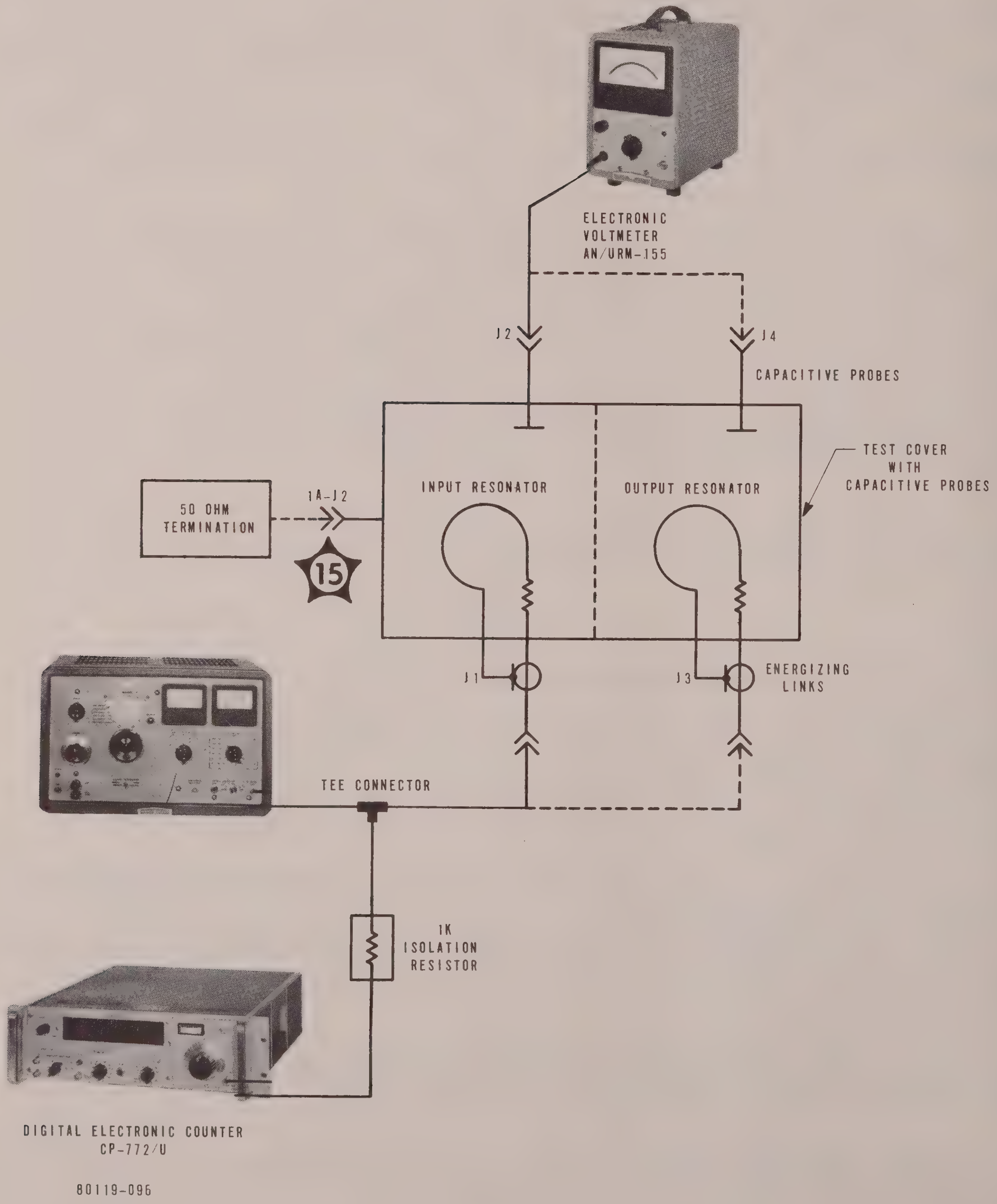

ELECTRONIC
VOLTMETER
AN/URM-155
J2
J4
CAPACITIVE PROBES
TEST COVER
WITH
CAPACITIVE PROBES
INPUT RESONATOR
OUTPUT RESONATOR
50 OHM
TERMINATION
1A-J2
15
J1
J3
ENERGIZING
LINKS
TEE CONNECTOR
1K
ISOLATION
RESISTOR
DIGITAL ELECTRONIC COUNTER
CP-772/U
80119-096

Figure 5-21. Test Setup for Measurement of RF Characteristics

TABLE 5-16. SAMPLE DATA SHEET FOR RF ALIGNMENT

ITEM	DESIGN OR STANDARD		CALCULATED	MEASURED
	MIN.	MAX.		
LOWER FREQUENCY LIMIT	–		–	
UPPER FREQUENCY LIMIT		–	–	
LOWER TEST FREQUENCY F1				
F1			–	–
BW_{UR1}		–	–	
Q_{UR1}			–	
BW_{UR2}		–	–	
Q_{UR2}			–	
$BW_{SR1(REV)}$			–	
$Q_{SR1(REV)}$			–	
Q_{SR1}	–	–	–	
K^2	–	–		–
E_2/E_1	–	–		
Q_{SR2}		–	–	–
MIDDLE TEST FREQUENCY F2				
F2			–	–
BW_{UR1}		–	–	
Q_{UR1}			–	
BW_{UR2}		–	–	
Q_{UR2}			–	
$BW_{SR1(REV)}$			–	
$Q_{SR1(REV)}$			–	
Q_{SR1}	–	–		
K^2	–	–		–

TABLE 5-16. SAMPLE DATA SHEET FOR RF ALIGNMENT (Continued)

ITEM	DESIGN OR STANDARD		CALCULATED	MEASURED
	MIN.	MAX.		
MIDDLE TEST FREQUENCY F2 (Continued)				
E_2/E_1	–	–		
Q_{SR2}	–	–		
UPPER TEST FREQUENCY F3				
F3			–	–
BW_{UR1}		–	–	
Q_{UR1}			–	
BW_{UR2}		–	–	
Q_{UR2}			–	
$BW_{SR1(REV)}$				
$Q_{SR1(REV)}$			–	
Q_{SR1}	–	–	–	
K^2	–	–		–
E_2/E_1	–	–		
Q_{SR2}	–	–		

Step 5. Adjust signal generator frequency to obtain a maximum (peak) indication on the voltmeter. Record the frequency indication on the digital electronic counter in the data sheet (see table 5-16) as the lower frequency limit of the input resonator. This frequency must be less than the maximum acceptable standard given in table 5-17 for the lower resonant frequency of the antenna coupler.

Step 6. Rotate FREQ ADJUST INPUT control in the INCREASE direction to the stop.

Step 7. Adjust signal generator frequency to obtain a maximum (peak) indication on the voltmeter. Record the frequency on the digital electronic counter in the data sheet (table 5-16) as the upper frequency limit of the resonator. This frequency must be greater than the minimum acceptable standard given in table 5-17 for the upper resonant frequency for the antenna coupler.

Step 8. On antenna coupler, remove the test cover and place a shorting strap across the input resonator capacitor C3 (see figure 5-36 for location of C3).

TABLE 5-17. INPUT AND OUTPUT RESONATOR TUNING LIMITS

COUPLER GROUP	ANTENNA COUPLER	LOWER RESONANT FREQUENCY LIMIT	UPPER RESONANT FREQUENCY LIMIT
AN/SRA-56	CU-1772	1.95 mc	6.15 mc
AN/SRA-57	CU-1774	3.90 mc	12.30 mc
AN/SRA-58	CU-1776	9.75 mc	30.75 mc

Step 9. Connect the 35-volt dc power supply between pin H (+) and pin T (-) on antenna coupler receptacle J1.

Step 10. Rotate OUTPUT COUPLING control in the DECREASE direction to the stop.

Step 11. Operate EMERGENCY-ON/OFF switch to ON.

Step 12. Rotate TUNE/OPERATE switch to TUNE-2 and ensure that automatic decoupling switch solenoid A5K1 energizes to remove the short from output resonator tuning capacitor C4.

Step 13. Replace the test cover. Ensure that energizing links do not touch inductors and capacitive probes do not touch capacitors. Secure all fasteners.

Step 14. Connect test equipment as shown in figure 5-21 so that the signal generator is connected to the test cover energizing link (J3) for the output resonator and the voltmeter to test cover capacitive probe (J4) of the output resonator. Do not connect 50-ohm termination to antenna coupler receptacle 1A-J2.

Step 15. Rotate FREQ ADJUST OUTPUT control in the DECREASE direction to the stop. Rotate FREQ ADJUST INPUT control to mid frequency.

Step 16. Adjust signal generator frequency to obtain a maximum (peak) indication on the voltmeter. Record the frequency indication on the digital electronic counter in the data sheet (see table 5-16) as the lower frequency limit of the output resonator. This frequency must be less than the maximum acceptable standard given in table 5-17 for the lower resonant frequency of the antenna coupler.

Step 17. Rotate FREQ ADJUST INPUT control in the INCREASE direction to the stop.

Step 18. Adjust signal generator frequency to obtain a maximum (peak) indication on the voltmeter. Record the frequency on the digital electronic counter in the data sheet (table 5-16) as the upper frequency limit of the output resonator. This frequency must be greater than the minimum acceptable standard given in table 5-17 for the upper resonant frequency for the antenna coupler.

Step 19. Remove the test cover, and remove the shorting strap from the input resonator capacitor C3.

5.2.2.3.5.4 Measurement of Input Resonator and Output Resonator Unloaded Q

This procedure ensures that the resonators present the required value of unloaded Q. If these required values are not within acceptable limits, check all components of the input or output resonator for loose or corroded connections; damaged or defective parts; and dirt and dust. Take corrective action as required, and repeat the entire measurement.

This procedure is a continuation of the measurement of input resonator tuning limits (paragraph 5.2.2.3.5.3).

Step 1. Rotate TUNE/OPERATE switch to OFF. Ensure that automatic decoupling switch solenoid A5 deenergizes to short the output resonator capacitor C4.

Step 2. Replace test cover. Ensure that energizing links do not touch inductors and capacitive probes do not touch capacitors.

Step 3. Connect test equipment to the test cover as shown in figure 5-21 so that signal generator is connected to the test cover energizing link (J1) of the input resonator and the voltmeter to the test cover capacitive probe (J2) for the input resonator.

Step 4. Set the signal generator to the lower test frequency (F1 in table 5-18) for the antenna coupler under test.

Step 5. Refer to paragraph 5.2.2.3.5.2, and measure the input resonator unloaded bandwidth and Q. Record the bandwidth as BW_{UR1} and the Q as Q_{UR1} in the data sheet (table 5-16). These values must be between the acceptable limits given in table 5-18.

Step 6. Set the signal generator to the middle test frequency (F2 in table 5-18) and repeat step 5.

Step 7. Set the signal generator to the upper test frequency (F3 in table 5-18) and repeat step 5.

Step 8. On the antenna coupler, remove the test cover and place a shorting strap across the input resonator capacitor C3 (see figure 5-36 for location of C3).

Step 9. Rotate TUNE/OPERATE switch to TUNE-2, and ensure that automatic decoupling switch solenoid A5K1 energizes to remove the short from output resonator tuning capacitor C4.

Step 10. Replace the test cover. Ensure that energized links do not touch inductors and capacitive probes do not touch capacitors. Secure all fasteners.

Step 11. Connect test equipment as shown in figure 5-21 so that the signal generator is connected to the test cover energizing link (J3) for the output resonator and the voltmeter to test cover capacitive probe (J4) of the output resonator.

Step 12. Set the signal generator to the lower test frequency (F1 in table 5-18) for the antenna coupler under test.

Step 13. Refer to paragraph 5.2.2.3.5.2, and measure the output resonator unloaded bandwidth and Q. Record the bandwidth as BW_{UR2} and the unloaded Q as Q_{UR2} in the data sheet (table 5-16). These values must be between the acceptable limits given in table 5-18.

TABLE 5-18. TEST FREQUENCIES AND STANDARDS FOR ALIGNMENT OF RF SECTION

TEST FREQUENCY	UNLOADED Q_{UR1}*		UNLOADED Q_{UR2}		LOADED Q_{SR1} (REV)		DESIGN Q_{SR2}
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
ANTENNA COUPLER CU-1772/SRA-56							
F1 2.0 mc	585	615	585	665	67	88	175
F2 4.0 mc	765	850	790	910	59	79	—
F3 6.0 mc	850	970	900	1020	64	80	—
ANTENNA COUPLER CU-1774/SRA-57							
F1 4.0 mc	735	780	780	850	86	94	200
F2 8.0 mc	915	1050	970	1140	86	94	—
F3 12.0 mc	910	1200	945	1300	90	101	—
ANTENNA COUPLER CU-1776/SRA-58							
F1 10.0 mc	935	990	925	995	90	97	200
F2 20.0 mc	1075	1225	1280	1390	88	96	—
F3 30.0 mc	700	850	1380	1465	88	97	—

* Electronic Q control connected, but not loaded

Step 14. Set the signal generator to the middle frequency (F2 in table 5-18) and repeat step 12.

Step 15. Set the signal generator to the upper test frequency (F3 in table 5-18) and repeat step 13.

Step 16. Remove test equipment and test cover from the antenna coupler, and remove shorting strap from input resonator. Replace the test cover and secure all fasteners.

Step 17. Rotate TUNE/OPERATE switch to OFF.

5.2.2.3.5.5 Measurement of Input Resonator Loaded Q and Adjustment of Input Link Connecting Straps

This procedure ensures that the input resonator presents the required value of loaded Q, provides for the adjustment of input link connecting straps, and checks the electronic Q control. The loaded Q is greatly affected by damaged or defective components within the electronic Q control and may yield wide deviations from the acceptable standards. If the required value of loaded Q cannot be attained, remove, repair, and replace the electronic Q control assembly and repeat the entire procedure from paragraph 5.2.2.3.5.4.

These procedures are a continuation of the measurement of unloaded Q, paragraph 5.2.2.3.5.4.

Step 1. Connect the test equipment to the test cover as shown in figure 5-21 so that signal generator is connected to the energizing link of the input resonator (J1) and the voltmeter to the capacitive probe of the input resonator (J2). Connect 50-ohm termination to antenna coupler receptacle 1A-J2 on back of coupler drawer assembly.

Step 2. Set the signal generator to the lower test frequency (F1 in table 5-18) for the antenna coupler under test.

Step 3. Refer to paragraph 5.2.2.3.5.2, and measure the input resonator reverse loaded bandwidth and Q. Record the bandwidth as $BW_{SR1\,(REV)}$ and the loaded Q as $Q_{SR1\,(REV)}$ in the data sheet (table 5-16).

Step 4. At the lower test frequency, derive the (forward) loaded Q (Q_{SR1}) of the input resonator from the formula:

$$Q_{SR1} = \frac{Q_{UR1}\left[Q_{SR1(REV)}\right]}{Q_{UR1} - Q_{SR1(REV)}}$$

The value of $Q_{SR1\,(REV)}$ is obtained from step 3 and Q_{UR1} from paragraph 5.2.2.3.5.4. Enter this derived value as the "measured" Q_{SR1} in the data sheet (table 5-16) for the lower test frequency.

Step 5. Set the signal generator to the middle test frequency (F2 in table 5-18) and repeat steps 3 and 4 to obtain the derived value of Q_{SR1} at that frequency. Enter this value of Q_{SR1} in the data sheet for the middle test frequency.

Step 6. Set the signal generator to the upper test frequency (F3 in table 5-18) and repeat steps 3 and 4 to obtain the derived value of Q_{SR1} at that frequency. Enter this value in the data sheet for the upper test frequency.

Step 7. Compare all three values of $Q_{SR1\,(REV)}$ with corresponding acceptable limits given in table 5-18. If the measured values are within the acceptable limits, no adjustment of the connecting straps is necessary; proceed with paragraph 5.2.2.3.5.6. If any of the measured values are not within the acceptable limits, proceed with step 8.

Step 8. Remove the test cover and adjust the loop area of the straps connecting the terminals (E1 and E2) of the electronic Q control (A4) and the input link assembly (L1) in the antenna coupler (see figure 5-36 for location of connecting straps). If the measured value of $Q_{SR1(REV)}$ is too high at the upper test frequency, adjust the straps to lower slightly the value of $Q_{SR1(REV)}$ at the lower test frequency. If the value of $Q_{SR1(REV)}$ is too low at the upper frequency, adjust the straps to raise slightly the value of $Q_{SR1(REV)}$ at the lower frequency.

Note

> The size of the loop formed by the connecting straps between the electronic Q control and the input link determines the degree of coupling between the input link and the input resonator. When the connecting straps are crossed, the coupling is aided and $Q_{SR1\,(REV)}$ decreases as the area of the loop increases. When the connecting straps are direct the coupling is opposed and $Q_{SR1\,(REV)}$ increases as the area of the loop increases. Make the adjustment to the connecting strap loop as required to increase or decrease the value of $Q_{SR1\,(REV)}$.

Step 9. Replace the test cover and repeat steps 1 through 8 as required until the measured value of Q_{SR1} is within acceptable limits.

Note

> If the measured value of $Q_{SR1(REV)}$ cannot be brought into the acceptable limits after a reasonable number of attempts trouble probably exists in the electronic Q control. Remove, repair, and replace the electronic Q control assembly, and repeat the entire procedure from paragraph 5.2.2.3.5.4.

Step 10. Disconnect all test equipment and remove test cover with capacitive probes.

5.2.2.3.5.6 Calculation of Expected Parameters for Adjustment of Interresonator Coupling

The interresonator coupling must be adjusted to obtain an optimum value of output resonator loaded Q. To establish this value in terms that can be easily measured, several parameters must be calculated against which the measurements can be compared. These parameters are the square of the coefficient of coupler (K^2) based on the lower test frequency; the expected value of output resonator loaded Q (Q_{SR2}) for the other test frequencies; and the expected ratio of output resonator voltage to input resonator voltage (E_2/E_1) at all test frequencies.

Use the following procedures to calculate these parameters. The various values of loaded and unloaded Q used in the formulas are entries in the data sheet (table 5-16) obtained during previous measurements or are design values specified by the manufacturer. (table 5-18).

Step 1. Ensure that all procedures set forth in paragraph 5.2.2.3.5.3 through paragraph 5.2.2.3.5.5 are complete and that all critical values measured in those procedures are within acceptable limits.

Step 2. Enter the design value of output resonator loaded Q given in table 5-18 in the data sheet (table 5-16) as Q_{SR2} for the lower test frequency (F1).

Step 3. At the lower test frequency (F1), calculate the square of the coefficient of coupling (K^2) from the formula

$$K^2 = \frac{Q_{UR1} - Q_{SR1}}{(Q_{SR2})(Q_{UR1})(Q_{SR1})}$$

The value of Q_{SR2} is obtained from step 2; the value of Q_{UR1} from paragraph 5.2.2.3.5.4, step 5; and the value of Q_{SR1} from paragraph 5.2.2.3.5.5, step 4. Enter the calculated value of K^2 in the data sheet for all three test frequencies.

Step 4. At the middle test frequency (F2), calculate the expected output resonator loaded Q (Q_{SR2}) from the formula

$$Q_{SR2} = \frac{Q_{UR1} - Q_{SR1}}{K^2 (Q_{UR1})(Q_{SR1})}$$

The value of K^2 is obtained from step 3; the value of Q_{UR1} from paragraph 5.2.2.3.5.4, step 6; and the value of Q_{SR1} from paragraph 5.2.2.3.5.5, step 5. Enter the calculated value of Q_{SR2} in the data sheet for the middle test frequency.

Step 5. At the upper test frequency (F3), calculate the expected output resonator loaded Q (Q_{SR2}) from the formula given in step 4. The value of K^2 is obtained from step 3; the value of Q_{UR1} from paragraph 5.2.2.3.5.4, step 7; and the value of Q_{SR1} from paragraph 5.2.2.3.5.5, step 6. Enter the calculated value of Q_{SR2} in the data sheet for the upper test frequency.

Step 6. At the lower test frequency (F1), calculate the expected ratio of output resonator voltage to input resonator voltage (E_2/E_1) using the formula

$$\frac{E_2}{E_1} = \sqrt{(Q_{SR2}) \left[\frac{(Q_{UR1} + Q_{SR1})^2}{(Q_{UR1})(Q_{SR1})(Q_{UR1} - Q_{SR1})} \right]}$$

The value of Q_{SR2} is obtained from step 2; the value of Q_{UR1} from paragraph 5.2.2.3.5.4, step 5; and the value Q_{SR1} from paragraph 5.2.2.3.5.5, step 4. Enter the calculated value of E_2/E_1 in the data sheet for the lower test frequency.

Step 7. At the middle test frequency (F2), calculate the expected ratio E_2/E_1 from the formula in step 6. The value of Q_{SR2} is obtained from step 4; the value of Q_{UR1} from paragraph 5.2.2.3.5.4, step 6; and the value of Q_{SR1} from paragraph 5.2.2.3.5.5, step 5. Enter the calculated value of E_2/E_1 in the data sheet for the middle test frequency.

Step 8. At the upper test frequency (F3), calculate the expected ratio E_2/E_1 from the formula given in step 6. The value of Q_{SR2} is obtained from step 5; the value of Q_{UR1} from paragraph 5.2.2.3.5.4, step 7; and the value of Q_{SR1} from paragraph 5.2.2.3.5.5, step 6. Enter the calculated value of E_2/E_1 in the data sheet for the upper test frequency.

5.2.2.5.3.7 Adjustment of Interresonator Coupling Procedures

The following bench procedures set the position of the coupling straps to obtain the optimum interresonator coupling based on the measurements and calculations of paragraphs 5.2.2.5.3.4 through 5.2.2.5.3.6. Follow these procedures carefully.

Step 1. Connect the 35-volt dc power supply between pin H (+) and pin T (-) on antenna coupler receptacle 1A-J1.

Step 2. Rotate OUTPUT COUPLING control in the DECREASE direction to the stop.

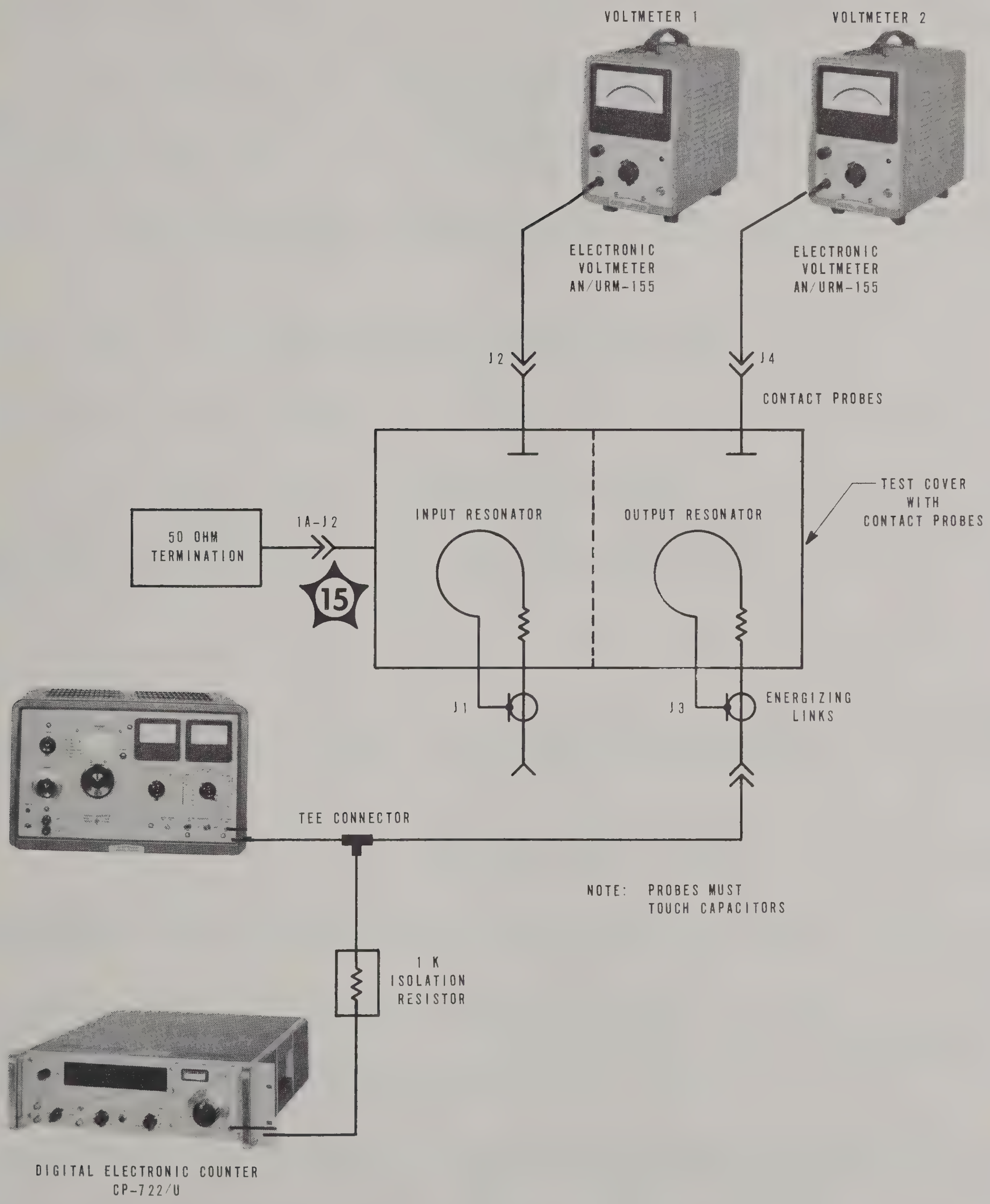
Step 3. Operate EMERGENCY-ON/OFF switch to ON.

Step 4. Rotate TUNE/OPERATE switch to TUNE-2 and ensure that automatic decoupling switch solenoid A5K1 energizes to remove the short from the output resonator tuning capacitor C4.

Step 5. Place special test cover on the antenna coupler. Adjust the capacitive probes so that each probe makes contact with the plate of the associated capacitor (see figure 5-22). Ensure that energizing links do not make contact with the inductors. Secure all fasteners.

Step 6. Connect test equipment to the test cover as shown in figure 5-22. Connect signal generator to test cover energizing link (J3) of output resonator. Connect voltmeter 2 to the test cover contact probe (J4) of the output resonator. Place a shorting strap from the contact probe receptacle (J2) of the input resonator to the test cover. Connect 50-ohm termination to the antenna coupler receptacle 1A-J2 on back of coupler drawer assembly.

Step 7. Set the signal generator to the lower test frequency (F1 in table 5-18) for the antenna coupler under test.


VOLTMETER 1
VOLTMETER 2
ELECTRONIC VOLTMETER AN/URM-155
ELECTRONIC VOLTMETER AN/URM-155
J2
J4
CONTACT PROBES
TEST COVER WITH CONTACT PROBES
50 OHM TERMINATION
1A-J2
15
INPUT RESONATOR
OUTPUT RESONATOR
J1
J3
ENERGIZING LINKS
TEE CONNECTOR
NOTE: PROBES MUST TOUCH CAPACITORS
1 K ISOLATION RESISTOR
DIGITAL ELECTRONIC COUNTER CP-722/U

80119-097

Figure 5-22. Test Setup for Measurement of Interresonator Coupling Parameters

Step 8. Rotate FREQ ADJUST OUTPUT control to obtain a maximum (peak) indication on voltmeter 2. Lock the control.

Step 9. Disconnect the shorting strap from receptacle J2 on the test cover, and connect voltmeter 1 to J2 to monitor the input resonator voltage.

Step 10. Rotate FREQ ADJUST INPUT control to obtain a minimum (null) indication on voltmeter 2. Label the indication on voltmeter 1 as E1.

Step 11. Reverse the meter probes so that voltmeter 1 is connected to J4 and voltmeter 2 is connected to J2 on the test cover. Label the indication on voltmeter 1 (J4) as E2.

Note

> By reversing the meters as in step 11, the same voltmeter is used for both measurements to obtain greater accuracy.

Step 12. Divide the value E1 obtained in step 10 into the value of E2 obtained in step 11 to find the ratio E_2/E_1.

Step 13. Repeat steps 10 through 12 twice and average the three readings. Enter this average value of E_2/E_1 in the data sheet (table 5-16) for the lower test frequency.

Step 14. Derive the measured value of output resonator loaded Q (Q_{SR2}) from the formula

$$Q_{SR2} = \left[\frac{E_2}{E_1}\right]^2 \left[\frac{(Q_{UR1})(Q_{SR1})(Q_{UR1} - Q_{SR1})}{(Q_{UR1} + Q_{SR1})^2}\right]$$

The value of E_2/E_1 is obtained from step 13; the value of Q_{UR1} from paragraph 5.2.2.3.5.4, step 5; and the value of Q_{SR1} from paragraph 5.2.2.3.5.5, step 4. Enter this value as the measured Q_{SR2} in the data sheet for the lower test frequency.

Step 15. Set the signal generator to the middle test frequency (F2 in table 5-18) and repeat steps 6 through 14 to obtain the average ratio E_2/E_1 and the derived value Q_{SR2}. Enter these values in the data sheet for the middle test frequency.

Step 16. Set the signal generator to the upper test frequency (F3 in table 5-18) and repeat steps 6 through 14 to obtain the average ratio E_2/E_1 and the derived value of Q_{SR2}. Enter these values in the data sheet for the upper test frequency.

Step 17. Compare the measured to the calculated values of E_2/E_1, and the measured to the calculated values of Q_{SR2}. If all measured values are with 5 percent of the calculated values, the antenna coupler is acceptable and no further adjustment of interresonator coupling is required. However, if any measured value exceeds 5 percent of the calculated value, proceed with step 18.

Step 18. Remove the test cover and set the coupling straps in accordance with the dimensions given in table 5-19, and repeat steps 5 through 17. If measured values are still not within 5 percent of calculated values proceed with step 19.

Step 19. Remove the test cover, and adjust slightly the top strap to improve the voltage ratio E_2/E_1. Move the top strap up to raise the ratio or down to lower the ratio. Repeat steps 5 through 17.

TABLE 5-19. SETTING OF INTERRESONATOR COUPLING STRAPS

ANTENNA COUPLER	BOTTOM STRAP FROM FLOOR OF COUPLER	TOP OF BOTTOM STRAP TO BOTTOM OF TOP STRAP
CU-1772/SRA-56	2-5/8" ±1/16"	4-7/8"
CU-1774/SRA-57	2-1/2" ±1/16"	5-5/8"
CU-1776/SRA-58	1-1/2" ±1/16"	6-3/8"

Step 20. Repeat step 19 as often as required until the measured values of E_2/E_1 and Q_{SR2} are within 5 percent of their respective calculated values.

Step 21. Remove all test equipment and test cover. Replace antenna coupler cover and restore the antenna coupler to service.

5.2.2.3.5.8 Alternate Method of Adjusting Interresonator Coupling

The procedures set forth in this paragraph describe an alternate method of adjusting the interresonator coupling during the alignment of the rf section. This alternate method is simplier, more direct, and eliminates the tedious mathematical computation required under paragraph 5.2.2.3.5.6. However, the entire coupler group (or eight-channel configuration) must be secured during the adjustment procedures for a single antenna coupler.

If it is possible to secure the coupler group(s) to use this alternate method, proceed in the following manner.

Step 1. Perform all procedures set forth in paragraphs 5.2.2.3.5.3 through 5.2.2.3.5.5 except the calculation of Q_{SR1} required under step 4 of paragraph 5.2.2.3.5.5.

Note

> The procedures in step 1 are bench procedures and do not require the coupler groups to be secured.

Step 2. Secure the coupler group(s) in accordance with paragraph 3.3.2.5 of the Operator's Handbook.

Step 3. Insert antenna coupler into the equipment cabinet in its original position at time of installation (see paragraph 2.4.3.3).

Step 4. Refer to paragraph 5.2.1.5.3 and perform the Worst Case, 3-to-1 VSWR Load Check only for the antenna coupler to be aligned.

Step 5. Compare the OUTPUT COUPLING dial indications obtained in step 4 with those obtained previously during reference standards measurements. If the OUTPUT COUPLING numbers in step 4 are within ±2.5 percent of the established reference standards, the antenna coupler is acceptable and no further adjustment is required. If the OUTPUT COUPLING numbers are not within these limits, proceed with step 6.

Step 6. Pull antenna coupler drawer out to the stops, remove top cover, and set the inter-resonator coupling straps in accordance with the dimensions given in table 5-19. Replace top cover and secure antenna coupler drawer in the equipment cabinet.

Step 7. Repeat steps 4 and 5. If the OUTPUT COUPLING numbers are still not within ±2.5 percent of the reference standard, proceed with step 8.

Step 8. Pull the antenna coupler drawer out to the stops and remove the top cover. If the OUTPUT COUPLING numbers obtained in step 7 are too high, raise the top strap slightly (approximately 1/8 inch); if too low, lower the top strap slightly. Replace top cover and secure the antenna coupler within the equipment cabinet.

Step 9. Repeat steps 4 and 5. If the OUTPUT COUPLING numbers are still not within the acceptable limits, repeat step 8.

Step 10. Repeat step 9 as required until the OUTPUT COUPLING numbers are within the acceptable limits as defined by the reference standards.

Step 11. Disconnect all test equipment and restore the coupler group(s) to service.

5.3 REPAIR

The repair procedures for Antenna Coupler Groups AN/SRA-56, -57 and -58 consist primarily of removal and replacement of component parts, subassemblies, and assemblies in the antenna coupler group. The following are general guide lines to be used when making repairs.

In all repairs and replacements, make every effort to duplicate the original condition of the equipment, and use standard replacement parts from stock. Whenever possible, run replacement wiring and interconnecting straps in the same position and manner as the original; if replacement components and associated wiring or straps are not oriented as close as possible to their original factory positions, difficulty in tuning and possible spurious radiation may be experienced.

Soft solder all wiring connections with rosin-core solder. Use the smallest amount of solder necessary for a good mechanical and electrical joint. Do not permit excess solder to drop on other components, or to remain within the chassis.

Check accessible components first. Systematically check a defective circuit and its associated components for continuity, defective resistors, shorted capacitors, loose connections, etc. Use a multimeter with 20,000 ohms-per-volt sensitivity or better for these tests. When performing continuity checks or resistance measurements, take into account other components that may be in shunt with the part under test. For accurate results, disconnect one lead of the part being checked before proceeding with the measurements.

Most repairs are limited to replacement only. When making emergency repairs where exact replacement of parts cannot be made, mark or tag conspicuously the temporarily repaired equipment. At the first opportunity, restore the temporarily repaired equipment to its original condition.

Certain parts or assemblies require electrical or mechanical alignment after replacement. Refer to paragraph 5.2.2.3 for the required procedures.

To aid in the removal, repair, and replacement of parts, subassemblies, and assemblies, additional information is contained throughout the maintenance section. Refer to the figures referenced under the repair procedures for the individual item for the location of components. Refer to table 5-20 for wire-running list. Refer to figure 5-48 for the interconnecting diagram, figure 5-49 for the power distribution diagram, and figures 5-50 and 5-51 for detailed schematic diagrams. Refer to Section 6 for the parts list to order replacement items.

5.3.1 Removal, Repair, and Replacement Procedures

The procedures that follow cover the removal, repair, and replacement of major assemblies and subassemblies, and of certain parts where such procedures are not obvious. In general, no special procedures are given for the repair of major assemblies or subassemblies. The repair of these items is limited to the replacement of associated components only, and these components are replaced in accordance with fundamental maintenance techniques.

WARNING

> Do not permit any one to repair the equipment alone, and do not permit personnel or equipment to come in contact with any output link while a transmitter is operating through the coupler group. These output links contain extremely high rf voltages that may be fatal if contacted. Antenna Coupler Groups AN/SRA-56, -57, and -58 are designed to permit repair on an individual coupler drawer assembly while other channels are operating. Whenever possible, set the tuning controls to a frequency not being used by a transmitter in the group. Follow repair procedures carefully and heed all cautions and warnings.

5.3.1.1 Antenna Coupler Drawer Assemblies 1A1, 1A2, 1A3, and 1A4

To remove and replace the coupler drawer assembly, proceed in the following manner.

Step 1. On antenna coupler, rotate TUNE/OPERATE switch to OFF.

Step 2. Loosen the 6 captive screws on the antenna coupler front panel.

Step 3. Slowly pull the drawer out to the stops.

Step 4. Remove the rf and control cable connectors from receptacle 1A-J1 and 1A-J2 (see figure 5-32 for location of receptacle).

WARNING

> The antenna coupler is heavy. Have two men support the antenna coupler drawer when removing it from the cabinet.

Step 5. Release the drawer by pushing down the stop locks.

Step 6. Gently slide the drawer along the slides until it is free, and lift from cabinet.

Step 7. Release slides and push slides back into cabinet.

Step 8. Replace the antenna coupler drawer by reversing the removal procedures except step 5; the stop locks will set automatically.

5.3.1.2 Power Supply Assembly, 1A5

To remove, repair, or replace the power supply assembly, proceed in the following manner.

WARNING

Remove 115-volt ac power at the source before performing the procedure.

Step 1. Loosen the 10 captive screws in the power supply panel.

WARNING

The power supply panel is heavy and not mounted on slides. Support the power supply assembly throughout the procedure.

Step 2. Carefully lay the power supply panel face down on its handles.

Step 3. Remove connector 1A6P11 from 1A5J1 (figure 5-23).

Step 4. Set the power supply panel upright.

Step 5. Repair the power supply assembly by replacing any defective components (see figure 5-23 for location of components).

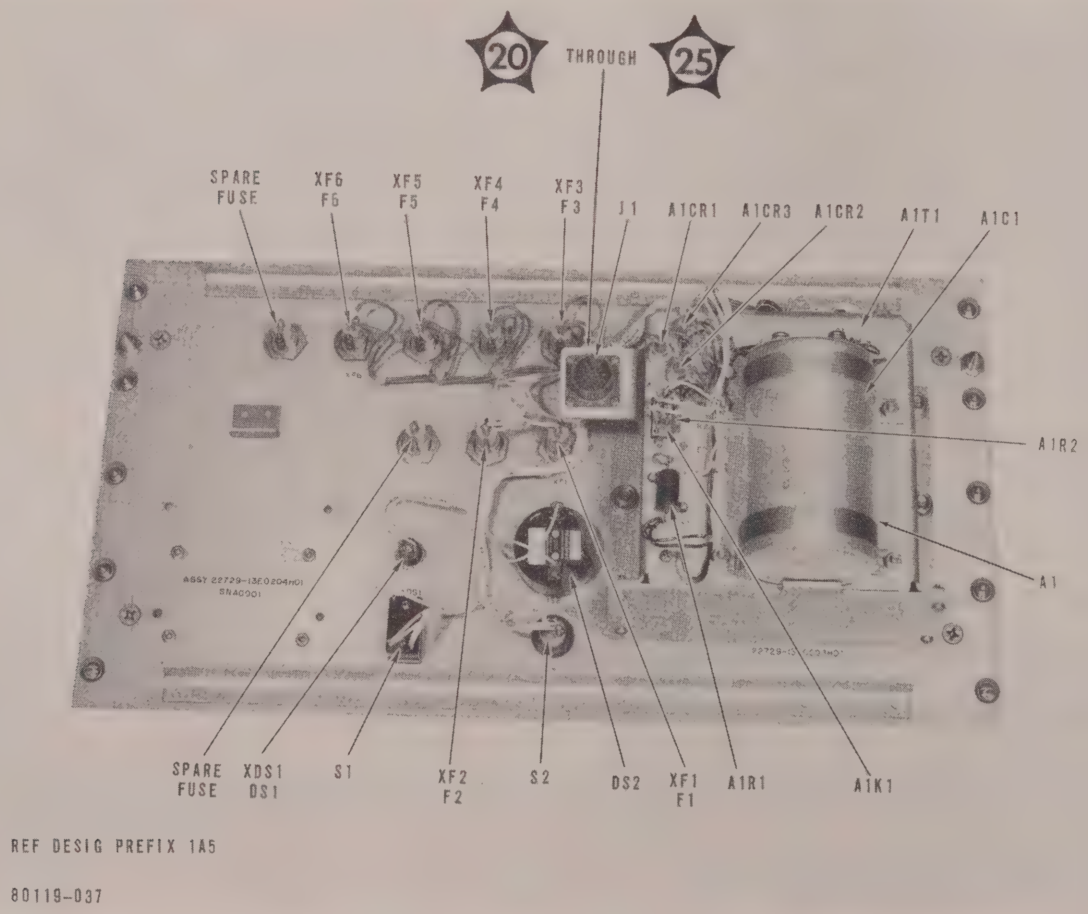

20
THROUGH
25
SPARE FUSE
XF6 F6
XF5 F5
XF4 F4
XF3 F3
J1
A1CR1
A1CR3
A1CR2
A1T1
A1C1
A1R2
A1
SPARE FUSE
XDS1 DS1
S1
XF2 F2
S2
DS2
XF1 F1
A1R1
A1K1
REF DESIG PREFIX 1A5
80119-037

Figure 5-23. Power Supply Panel, Location of Components

Step 6. Replace the power supply assembly by reversing the removal procedures.

5.3.1.3 Power Attenuator, 1A6A1

To remove, repair, or replace the power attenuator, proceed in the following manner:

WARNING

> Remove all rf input and output cables from the cabinet(s) and 115-volt ac power at the source before proceeding.

Step 1. Remove antenna couplers 1A2, 1A3, and 1A4 from the electrical equipment cabinet (see paragraph 5.3.1.1).

WARNING

> Short all output coupling links to ground before proceeding.

Step 2. Disconnect the rf cables from power attenuator receptacles 1A6A1J1 and 1A6A1J2. (See figures 5-24 through 5-26 for location of power attenuator.)

Step 3. Loosen the captive screws on the power attenuator.

Step 4. Swing the power attenuator out of its mounting to obtain access to the components.

Step 5. Repair the power attenuator by replacing any defective components (see figure 5-27 for location of components).

Step 6. Replace the power attenuator by reversing the removal procedure.

5.3.1.4 Operate Reflectometer Assembly, 1A6A2, 1A6A3, 1A6A4, or 1A6A5; and Tune Reflectometer Assembly, 1A6A6

To remove, repair, or replace the operate or tune reflectometer assembly, proceed in the following manner.

WARNING

> Remove all rf input cables from the cabinet(s) and 115-volt ac power at the source.

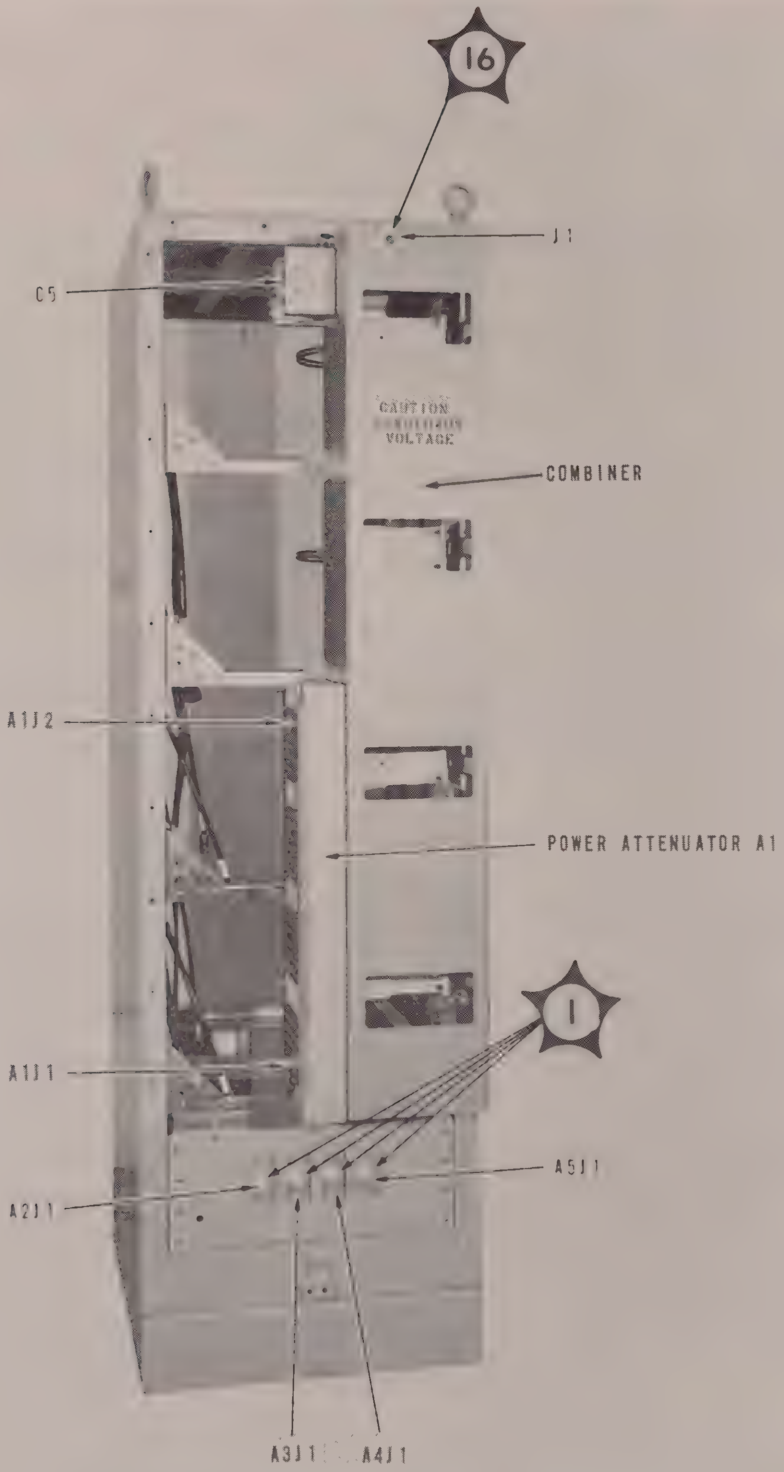
Step 1. Remove antenna coupler drawer 1A4 from the cabinet in accordance with paragraph 5.3.1.1.

WARNING

> Short the output coupling link to ground before proceding.

Step 2. Disconnect the two coaxial cables from reflectometer connector 1A6A-J1 and 1A6A-J2 and the control cable from connector 1A6A-J3. (See figure 5-28 for location of reflectometers and figures 5-18 and 5-19 for location of 1A6A-J1, J2, and J3.)

Step 3. Remove the four retaining screws and associated washers from the reflectometers. Retain the hardware.


16
J1
C5
CAUTION
VOLTAGE
COMBINER
A1J2
POWER ATTENUATOR A1
1
A1J1
A5J1
A2J1
A3J1
A4J1

REF DESIG PREFIX 1A6

80119-033

Figure 5-24. Electrical Equipment Cabinet CY-6422/SRA-56, Rear View, Location of Components

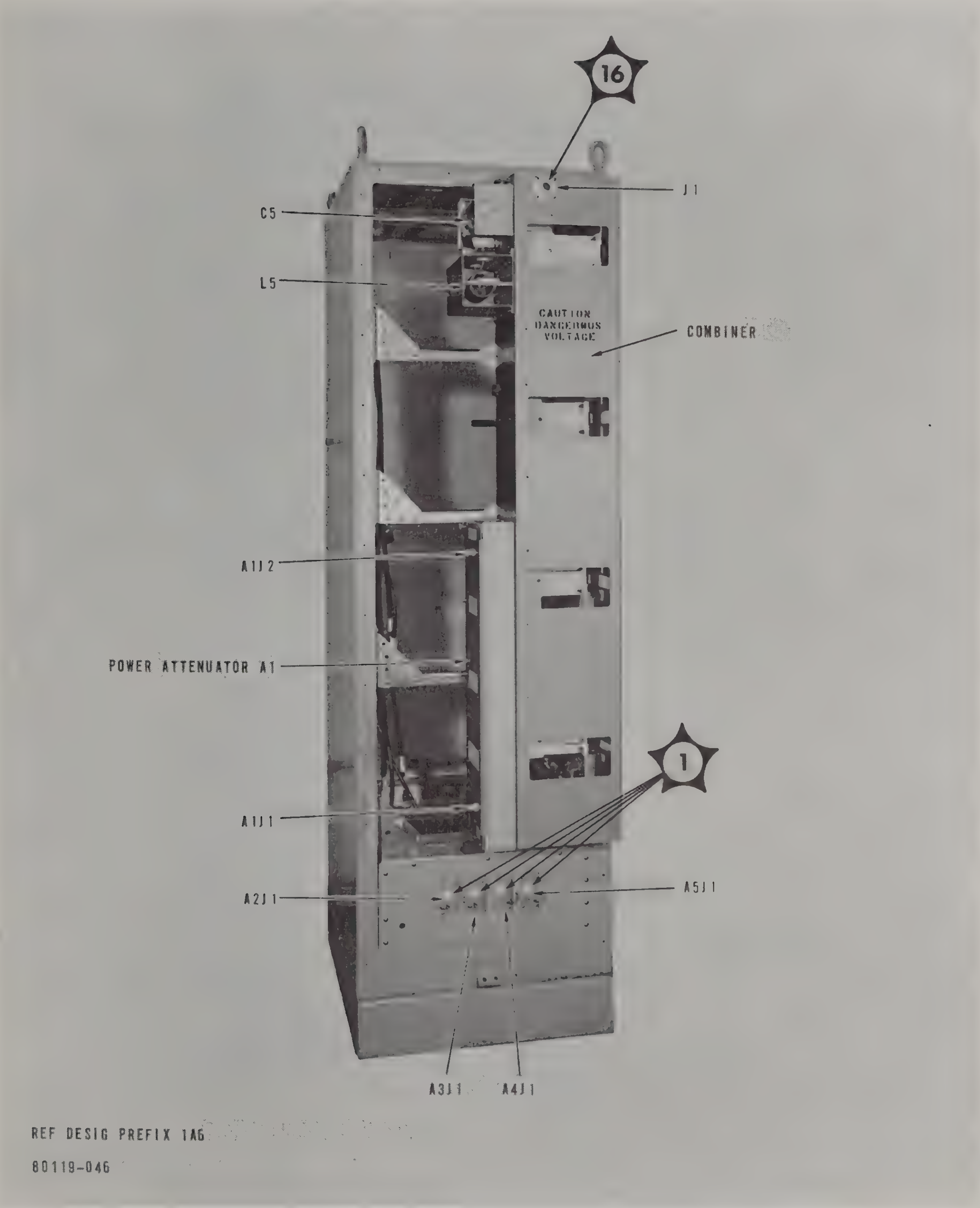
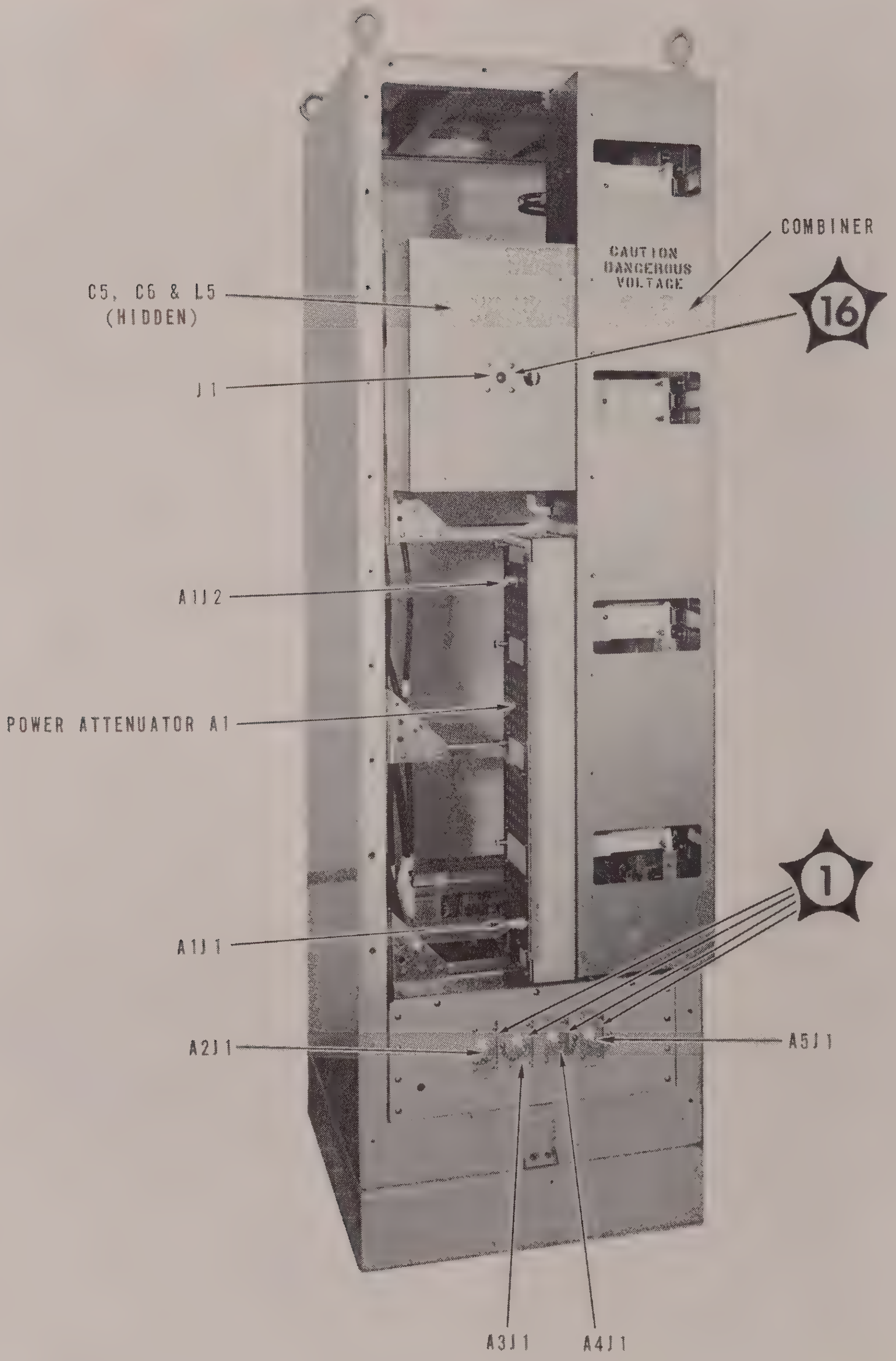

16
J1
C5
L5
CAUTION
DANGEROUS
VOLTAGE
COMBINER
A1J2
POWER ATTENUATOR A1
1
A1J1
A2J1
A5J1
A3J1
A4J1
REF DESIG PREFIX 1A6
80119-046

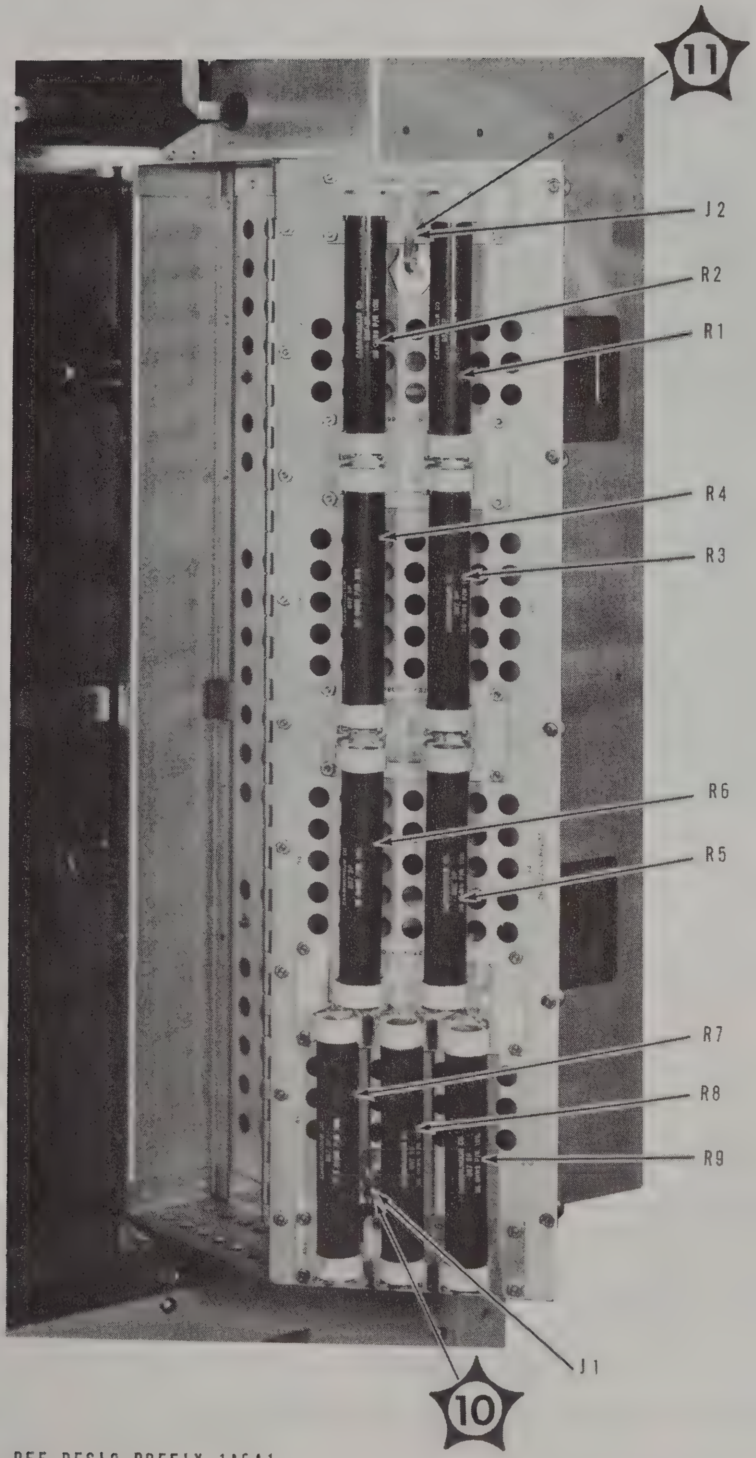
Figure 5-25. Electrical Equipment Cabinet CY-6423/SRA-57, Rear View, Location of Components


COMBINER
CAUTION DANGEROUS VOLTAGE
C5, C6 & L5 (HIDDEN)
16
J1
A1J2
POWER ATTENUATOR A1
1
A1J1
A2J1
A5J1
A3J1
A4J1

REF DESIG PREFIX 1A6

80119-047

Figure 5-26. Electrical Equipment Cabinet CY-6424/SRA-58, Rear View, Location of Components


11
J2
R2
R1
R4
R3
R6
R5
R7
R8
R9
J1
10

REF DESIG PREFIX 1A6A1

80119-032

Figure 5-27. Power Attenuator, Location of Components

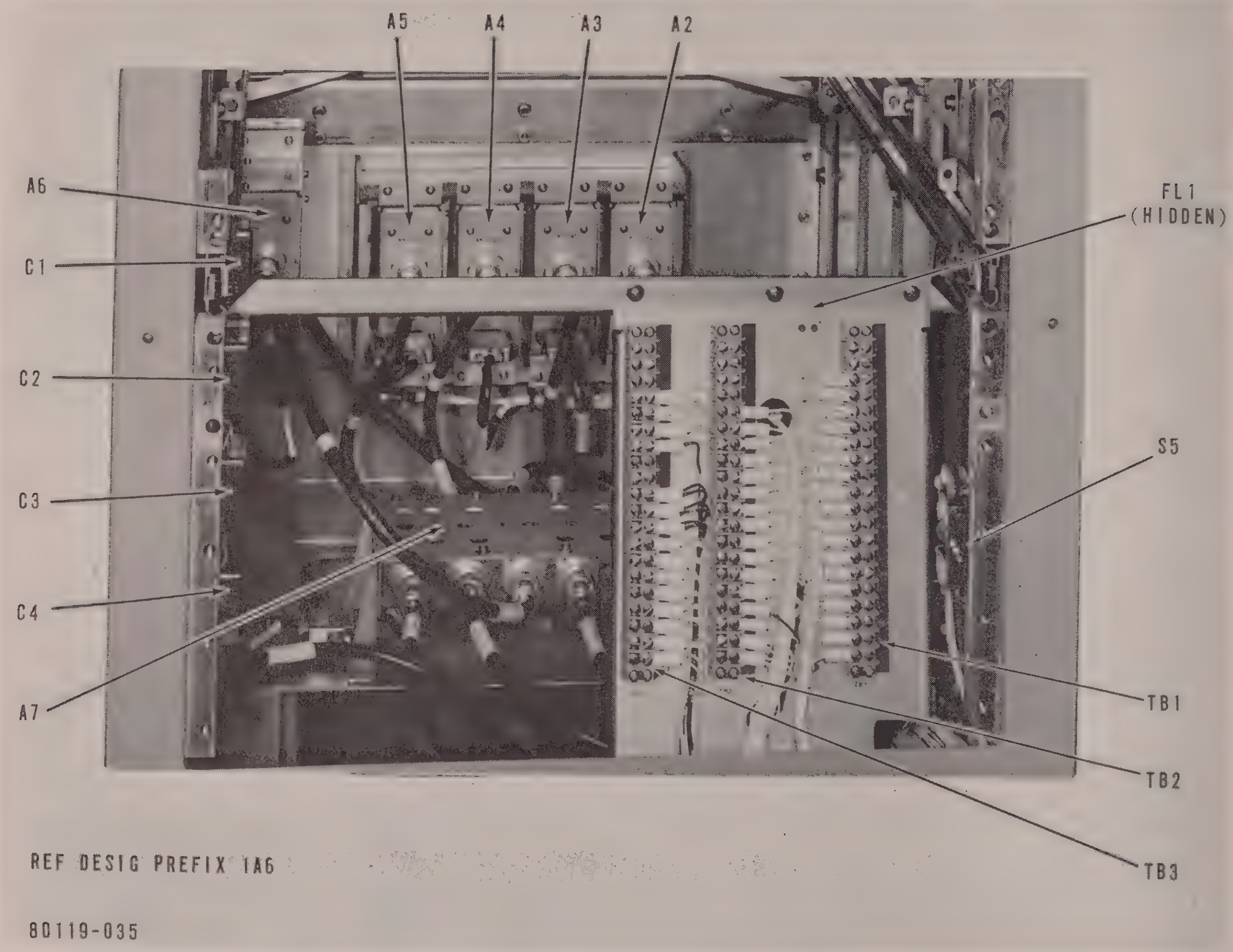


Figure 5-28. Electrical Equipment Cabinet, Lower Front View, Location of Components

Step 4. Lift the reflectometer out of the equipment cabinet.

Step 5. Repair the reflectometer by replacing any defective components (see figures 5-18 and 5-19 for location of components).

Step 6. Align and calibrate the new or repaired reflectometer in accordance with paragraph 5.2.2.3.1 (operate reflectometer) or 5.2.2.3.2 (tune reflectometer) before installing in the equipment cabinet.

Step 7. Replace the reflectometer by reversing the removal procedures.

5.3.1.5 RF Relay Assembly, 1A6A7

To remove, repair or replace the rf relay assembly, proceed in the following manner:

WARNING

Remove all rf input cables from the cabinet(s) and 115-volt ac power at the source before proceeding.

Step 1. Remove antenna coupler 1A4 from the cabinet in accordance with paragraph 5.3.1.1.

WARNING

Short the output coupling link to ground before proceeding.

Step 2. Disconnect the 10 rf cable assemblies from the relay assembly (see figure 5-28 for location of rf relay assembly).

Step 3. Disconnect the control cable from rf relay connector 1A6A7J11.

Step 4. Remove screws and washers holding the rf relay assembly to its support. Retain the hardware.

Step 5. Lift the relay assembly up and out of the equipment cabinet.

Step 6. Repair the rf relay assembly by replacing any defective component (see figure 5-29 for location of components).

Step 7. Replace the rf relay assembly by reversing the removal procedures.

5.3.1.6 Antenna Coupler Front Panel

The antenna coupler front panel must be removed to permit access to many of the components mounted on it as well as those within the antenna coupler drawer assembly. To remove and replace the front panel, proceed in the following manner.

Step 1. Remove the antenna coupler drawer assembly in accordance with paragraph 5.3.1.1, and place drawer assembly on work bench.

Step 2. Remove each control knob by loosening the two set screws.

Step 3. Remove the six retaining screws and lay the front panel face down on the work bench. Retain the hardware.

Step 4. Repair any defective component by replacement of the defective item (see figure 5-30 for location of components).

Step 5. Replace the front panel by reversing the removal procedures.

5.3.1.7 TUNE/OPERATE Switch 1A1A6S1S2, 1A2A6S1S2, 1A3A6S1S2, 1A4A6S1S2

To remove the rotary TUNE/OPERATE switch A6S1 or pushbutton switch A6S2, proceed in the following manner.

Step 1. Remove the front panel in accordance with paragraph 5.3.1.6.

Step 2. Unsolder and tag all leads to the TUNE/OPERATE switch A6S1 and A6S2 (see figure 5-30 for location of switch A6S1S2).

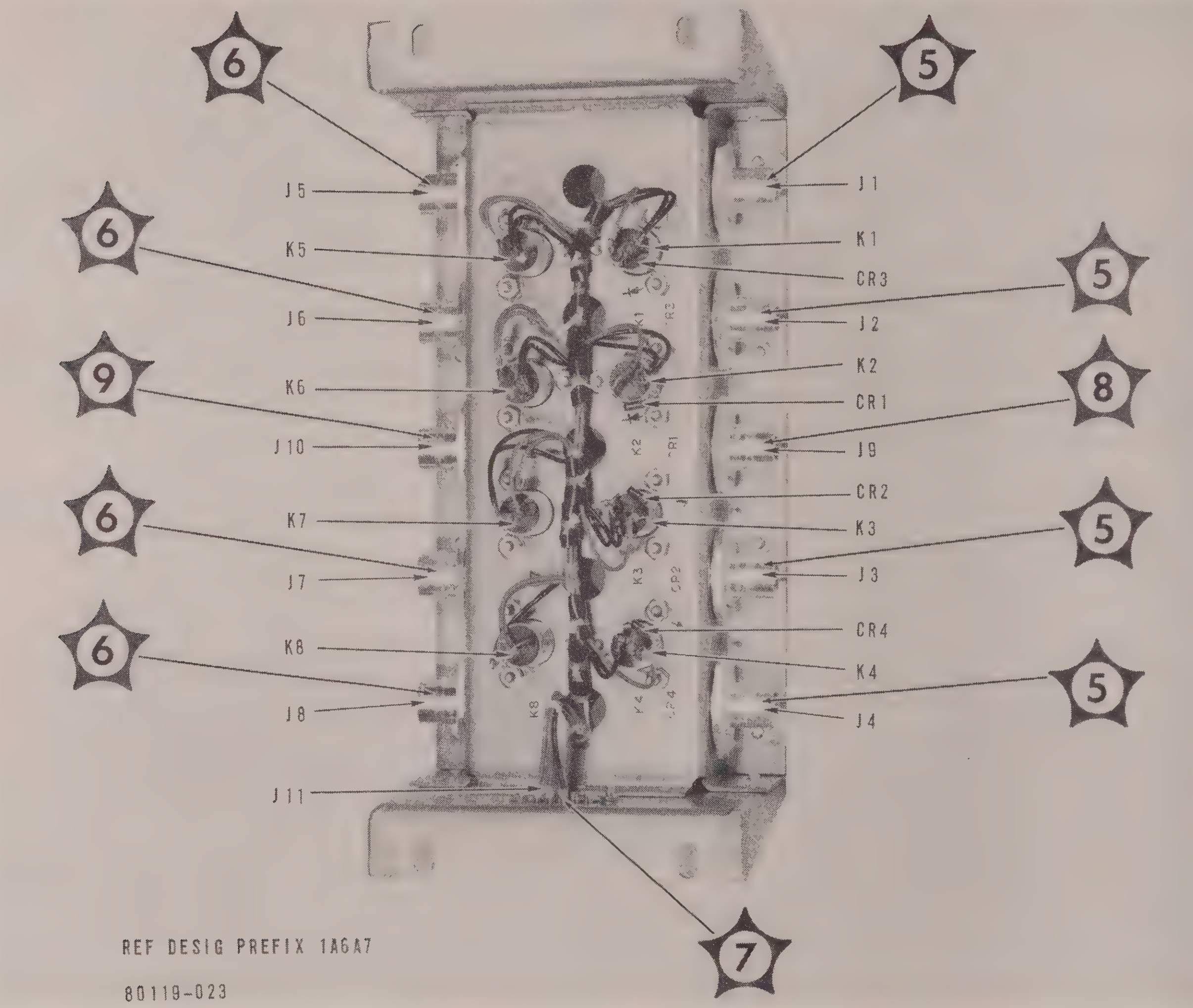

6
5
J5
J1
6
K5
K1
CR3
5
J6
J2
9
K6
K2
CR1
8
J10
J9
CR2
6
K7
K3
5
J7
J3
CR4
6
K8
K4
5
J8
J4
J11
REF DESIG PREFIX 1A6A7
80119-023
7

Figure 5-29. RF Relay Assembly, Location of Components

Step 3. To remove switch A6S1S2, remove the nut that secures it to the front panel, and lift the switch clear.

Step 4. To remove pushbutton switch A6S2 from the switch assembly, remove stud nuts and end plates containing the pushbutton switch and remove switch A6S2.

Note

Maintain pressure on rotary switch decks to eliminate accidental disassembly of rotary switch decks.

Step 5. Repair any defective component of the switch by replacement of the defective items.

Step 6. Replace the switch by reversing the removal procedures.

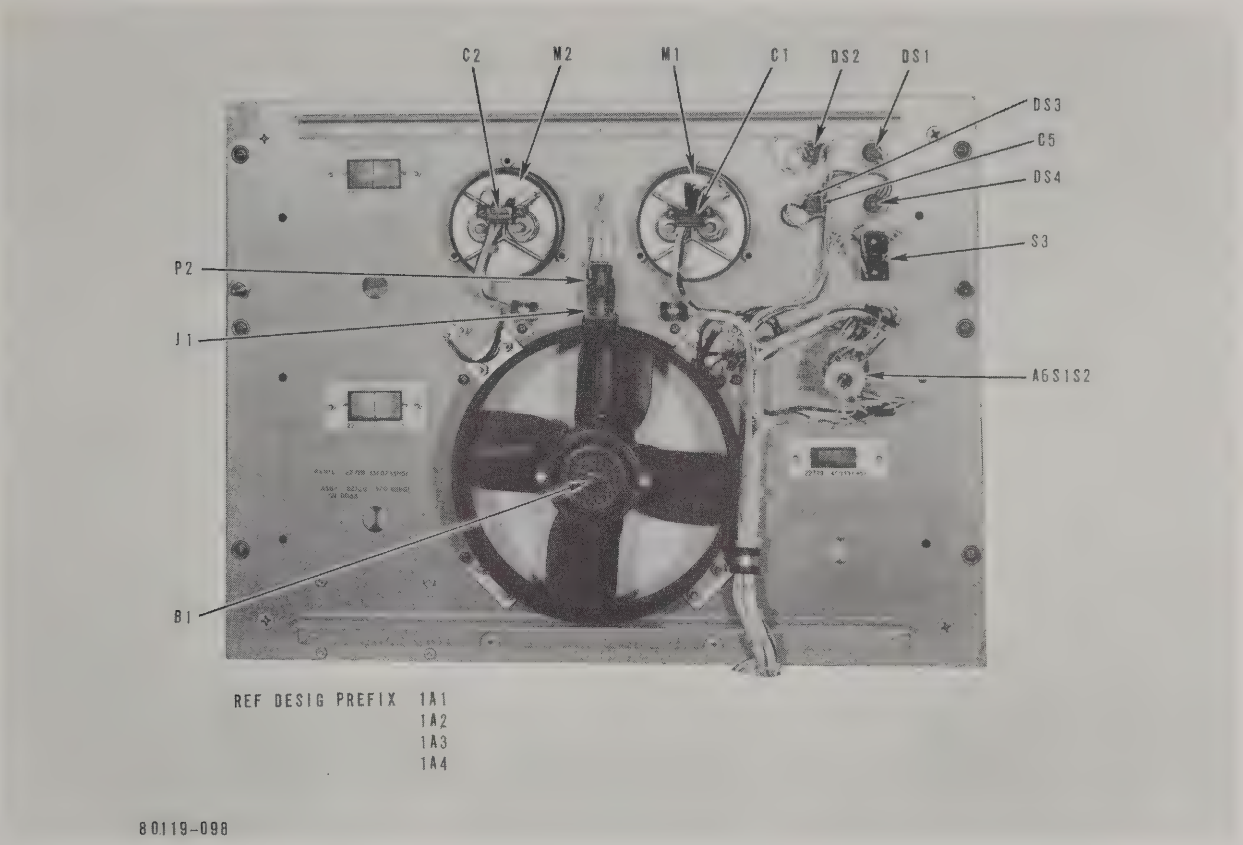


Figure 5-30. Front Panel, Rear View, Location of Components

5.3.1.8 Control Drive Assemblies

To remove or replace the input capacitor, output capcitor, or coupling drive assembly, proceed in the following manner.

Step 1. Remove the front panel in accordance with paragraph 5.3.1.6.

Step 2. For either capacitor drive assembly, remove the four screws and associated hardware securing the assembly to the filter box and lift the assembly free (see figure 5-31). Retain the hardware.

Step 3. For the coupling drive assembly, loosen the eccentric idler gear, remove the four screws and nuts that secure the assembly to the side of the antenna coupler drawer, and retain the hardware. Tilt the assembly slightly to loosen the drive chain and lift the assembly free.

Step 4. Repair the control drive assembly by replacing any defective components.

Step 5. Align the capacitor drive assembly in accordance with paragraph 5.2.2.3.3. Replace the capacitor drive assembly by reversing the removal procedure.

Step 6. Replace the coupling control drive assembly by following steps 7 through 9.

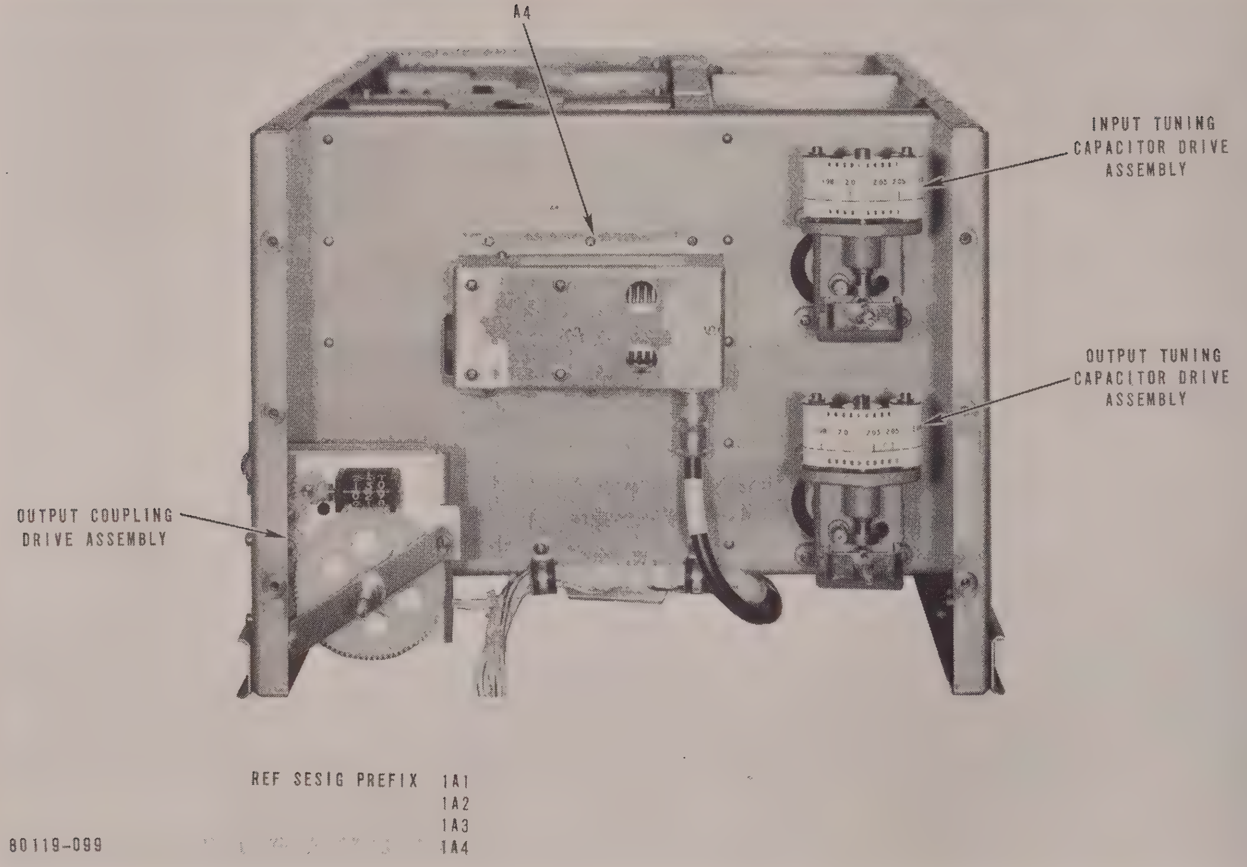

A4
INPUT TUNING CAPACITOR DRIVE ASSEMBLY
OUTPUT TUNING CAPACITOR DRIVE ASSEMBLY
OUTPUT COUPLING DRIVE ASSEMBLY
REF DESIG PREFIX 1A1
1A2
1A3
1A4
80119-099

Figure 5-31. Antenna Coupler, Front View, Location of Components

Step 7. Rotate sprocket on link coupling carriage (see figure 5-32) until shaft screw reaches the minimum position. Set the stop on the shaft screw.

Step 8. Mount the coupling control drive assembly by reversing step 3.

Step 9. Replace control knob on coupling control drive shaft and rotate the output coupling control maximum counterclockwise. Set the stop on coupling control assembly, and set the three-digit counter to 000.

Step 10. Remove control knobs and replace front panel in accordance with paragraph 5.3.1.6.

5.3.1.9 Electronic Q Control Assembly 1A1A4, 1A2A4, 1A3A4, or 1A4A4

To remove, repair, or replace the electronic Q assembly (A4), proceed in the following manner.

Step 1. Remove the front panel in accordance with paragraph 5.3.1.6.

Step 2. Remove rf input cable from electronic Q control connector 1A-A4J1.

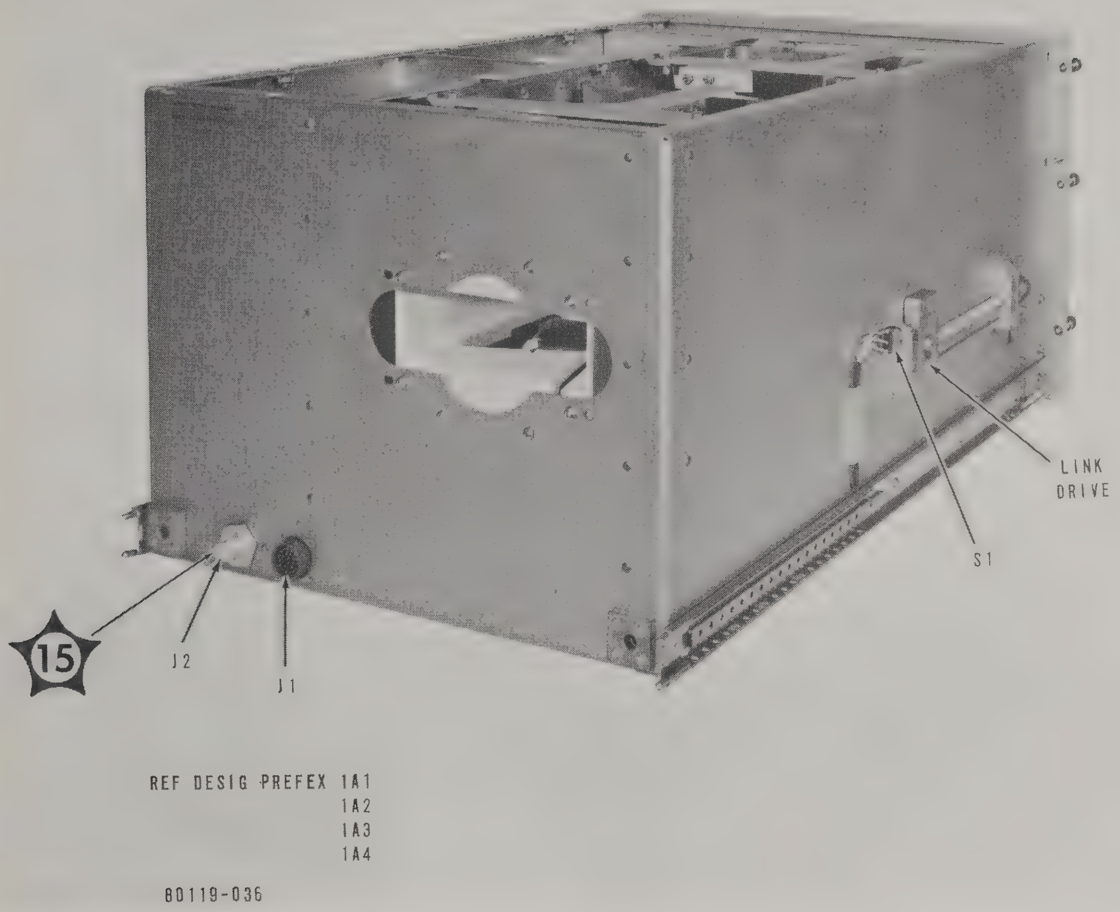


Figure 5-32. Antenna Coupler, Side and Rear View, Location of Components

Step 3. Remove connecting straps from output terminals of the electronic Q assembly to input link assembly. Be careful not to deform the connecting straps.

Step 4. Remove six screws and nuts securing the assembly to the filter box and lift the assembly free.

Step 5. Repair the electronic Q assembly by replacing any defective component (see figures 5-33 through 5-35 for location of components).

Step 6. Replace the electronic Q assembly by reversing the removal procedures.

Step 7. Perform all rf measurement and alignment procedures given in paragraph 5.2.2.3.5 before restoring the antenna coupler to service.

5.3.1.10 Input Tuning Capacitor Assembly 1A1C3, 1A2C3, 1A3C3, or 1A4C3

To remove or replace the input capacitor assembly (C3), proceed in the following manner.

Step 1. Remove the coupler drawer assembly in accordance with paragraph 5.3.1.1, and place drawer assembly on work bench.

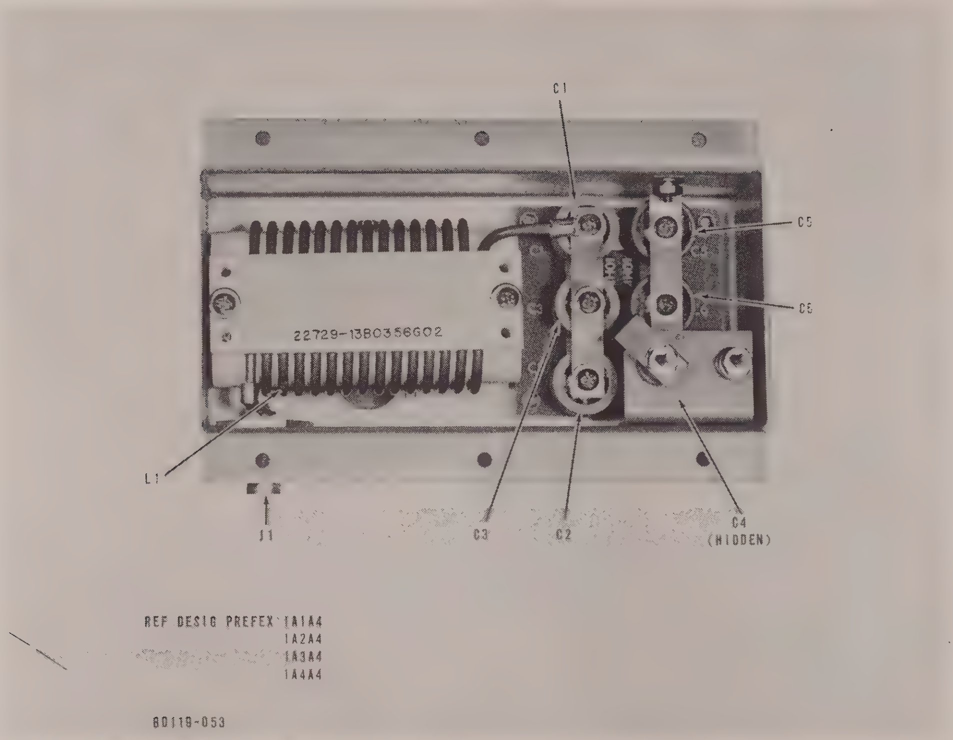

C1
C5
C6
22729-13B0356G02
L1
J1
C3
C2
C4
(HIDDEN)
REF DESIG PREFIX 1A1A4
1A2A4
1A3A4
1A4A4
80119-053

Figure 5-33. Electronic Q Control, AN/SRA-56, Location of Components

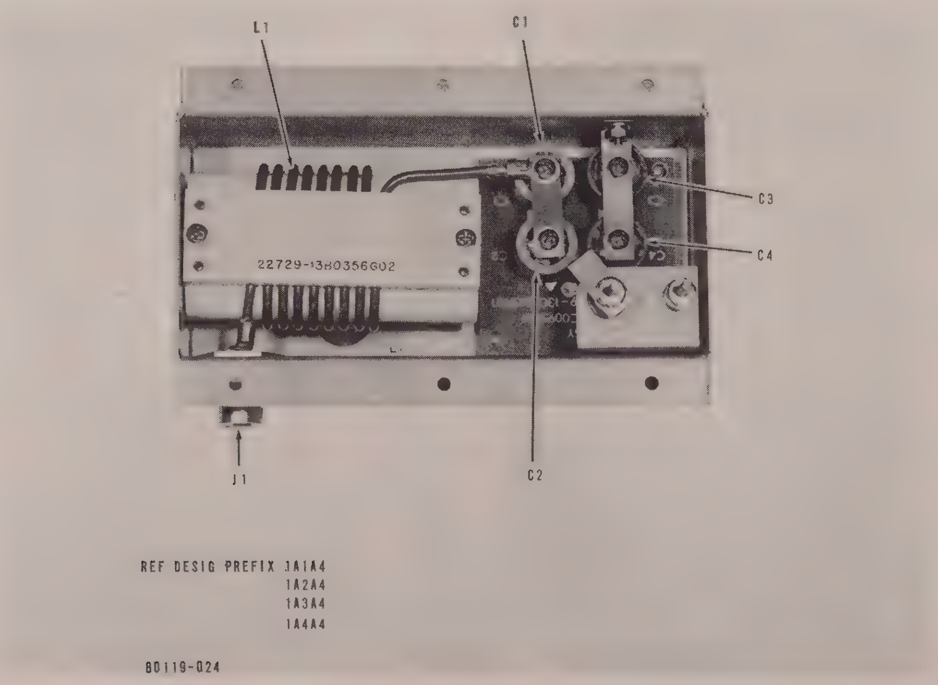

L1
C1
C3
C4
22729-13B0356G02
J1
C2
REF DESIG PREFIX 1A1A4
1A2A4
1A3A4
1A4A4
80119-024

Figure 5-34. Electronic Q Control, AN/SRA-57, Location of Components

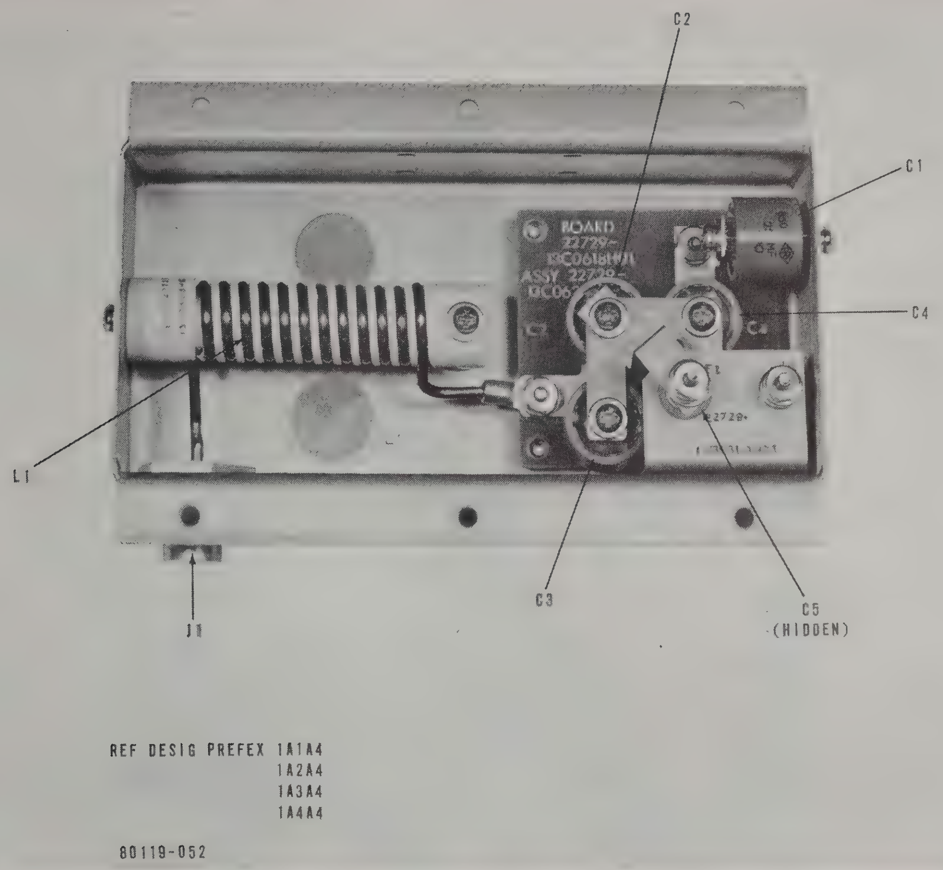


Figure 5-35. Electronic Q Control, AN/SRA-58, Location of Components

Step 2. Remove both the top and bottom covers from the coupler drawer, and retain the hardware.

Step 3. Remove the front panel in accordance with paragraph 5.3.1.6.

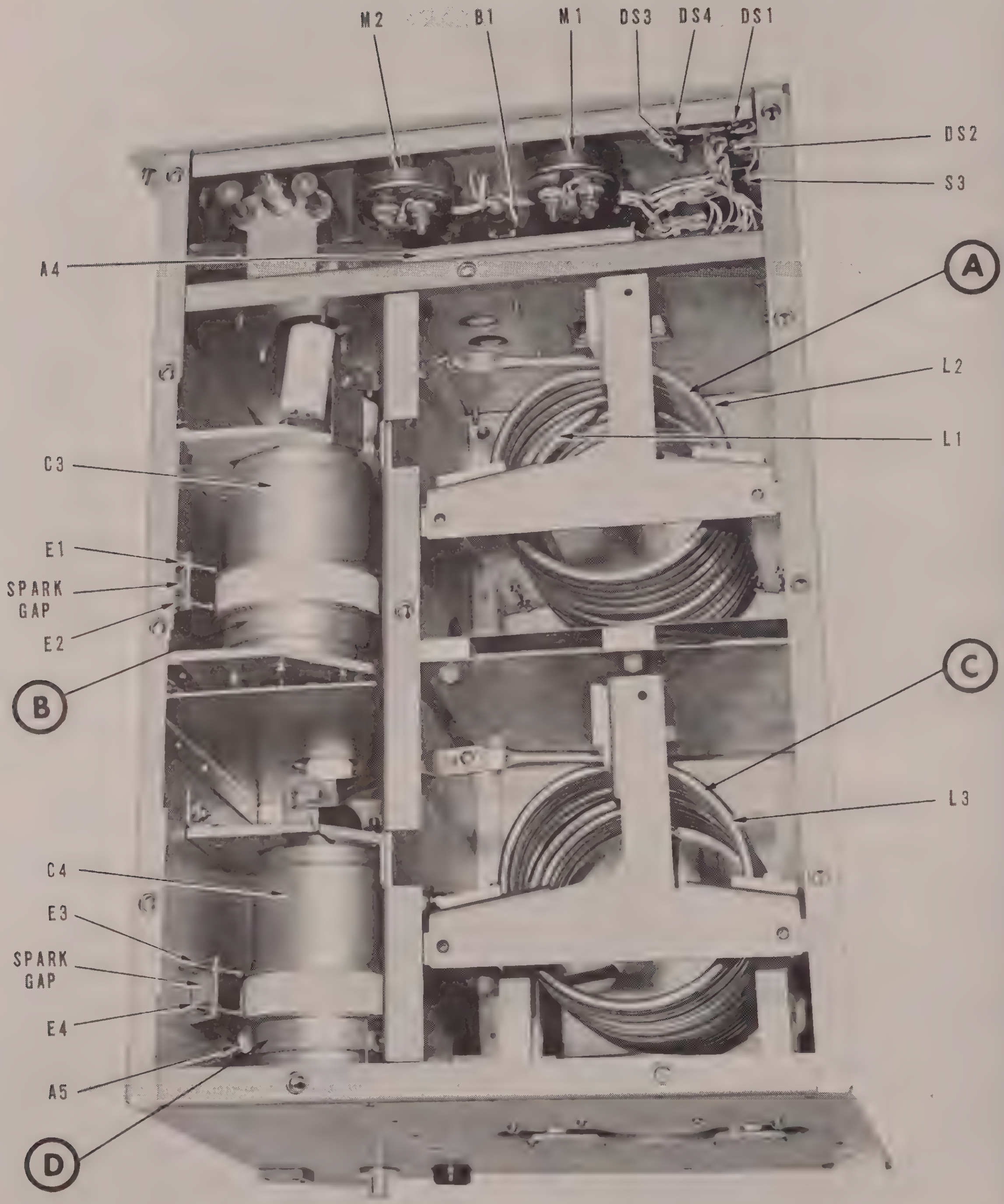
Step 4. Remove the output capacitor drive assembly in accordance with paragraph 5.3.1.8.

Step 5. Remove the output capacitor drive shaft (see figure 5-36 for location of components).

Step 6. Remove the two pan head screws and attaching hardware from the copper strap that connects capacitor C3 to inductor L2. Retain the screws and hardware.

Step 7. Turn the coupler drawer on its side, and remove the four pan head screws holding the capacitor assembly to the drawer bottom of the coupler drawer assembly.

Step 8. Turn the coupler drawer on its base, and remove the six pan head screws holding the assembly to the side of the drawer.


M2
B1
M1
DS3
DS4
DS1
DS2
S3
A4
A
L2
L1
C3
E1
SPARK GAP
E2
B
C
L3
C4
E3
SPARK GAP
E4
A5
D

REF DESIG PREFIX 1A1, 1A2, 1A3, OR 1A4

80119-030

Figure 5-36. Antenna Coupler, Top View, Location of Components

Step 9. Slide the input capacitor back to disengage the tuning drive shaft and remove the capacitor assembly from the drawer. Be careful not to bend the copper straps.

Step 10. Replace the input tuning capacitor by reversing the removal procedures.

Step 11. Replace capacitor drive assembly in accordance with paragraph 5.3.1.8 and front panel in accordance with paragraph 5.3.1.6.

Step 12. Perform all rf measurement and alignment procedures in paragraph 5.2.2.3.5 before restoring the antenna coupler to service.

5.3.1.11 Output Tuning Capacitor Assembly 1A1C4, 1A2C4, 1A3C4, 1A4C4

To remove or replace capacitor assembly (C4), proceed in the following manner.

Step 1. Remove the coupler drawer assembly in accordance with paragraphs 5.3.1.1 and and place drawer assembly on work bench.

Step 2. Remove both the top and bottom covers from the coupler drawer, and retain the hardware.

Step 3. Remove the two pan head screws and attaching hardware from the copper straps that connect capacitor C4 to inductor L3. Retain the screws and hardware (see figure 5-36 for location of components).

Step 4. Turn the coupler drawer on its side, and remove the four pan head screws retaining the capacitor to the drawer bottom.

Step 5. Turn the drawer on its base, and remove the six pan head screws and hardware that hold the capacitor assembly to the side of the drawer.

Step 6. Slide the capacitor assembly back to disengage the tuning drive shaft, and lift the capacitor or assembly out of the drawer. Be careful not to bend the copper straps.

Step 7. Replace the output tuning capacitor by reversing the removal procedures.

Step 8. Align the capacitor drive assembly in accordance with paragraph 5.2.2.3.3.

Step 9. Perform all rf measurement and alignment procedures in paragraph 5.2.2.3.5 before restoring the antenna coupler to service.

5.3.1.12 Input Link Assembly 1A1L1, 1A2L1, 1A3L1, or 1A4L1, and Input Resonator Inductor Assembly 1A1L2, 1A2L2, 1A3L2, or 1A4L2

To remove and replace the input link assembly (L1) or input resonator inductor assembly (L2), proceed in the following manner.

Step 1. Remove the coupler drawer assembly in accordance with paragraph 5.3.1.1 and place drawer assembly on work bench.

Step 2. Remove the top cover from the coupler drawer and retain the hardware.

Step 3. Remove the top inductor assembly mounting by removing the two pan head machine screws and attaching hardware. Retain the screws and hardware.

Step 4. Remove the two screws that hold the connecting straps from capacitor C3 to the inductor L2. Retain the screws.

Step 5. Remove the screw and associated hardware holding the input inductor L2 center-tap strap to the drawer chassis.

Step 6. Release the two copper straps connecting input link L1 to the electronic Q control at L1, and replace hardware securing the input link assembly.

Note

Be careful not to bend the two copper connecting straps.

Step 7. Remove the three pan head screws retaining the input inductor L2 assembly bottom mounting plate, and retain the screws.

Step 8. Carefully lift up on the inductor assembly and remove from the coupler drawer.

Step 9. Replace the input inductor L2 assembly by reversing the removal procedures.

Step 10. Perform all rf measurement and alignment procedures in paragraph 5.2.2.3.5 before restoring antenna coupler to service.

5.3.1.13 Output Resonator Inductor Assembly 1A1L3, 1A2L3, 1A3L3, or 1A4L3

To remove or replace the output resonator inductor assembly (L3), proceed in the following manner.

Step 1. Remove the coupler drawer assembly in accordance with paragraph 5.3.1.1, and place drawer assembly on work bench.

Step 2. Remove the top cover from the coupler drawer, and retain the hardware.

Step 3. Remove the two coupling loop guides by removing the four pan head machine screws and attaching hardware on rear of chassis (see figure 5-32). Retain the screws and hardware.

Step 4. Remove the two screws that hold the mounting plate to the cavity walls. Retain the screws.

Step 5. Remove the two pan head screws and hardware that connect inductor L3 to tuning capacitor C4 (see figure 5-36 for location of components).

Step 6. Remove the screw and attaching hardware holding the output inductor center tap strap to the drawer chassis.

Step 7. Remove the three pan head screws retaining the output inductor bottom mounting plate, and retain the screws.

Step 8. Carefully lift up on the inductor assembly and remove from the coupler drawer.

Step 9. Replace the output inductor assembly by reversing the removal procedures.

Step 10. Perform all rf measurement and alignment procedures in paragraph 5.2.2.3.5 before restoring antenna coupler to service.

5.3.1.14 Drawer Slide Assembly

To remove or replace drawer slide assembly, proceed in the following manner.

Step 1. Remove the coupler drawer in accordance with paragraph 5.3.1.1.

Step 2. Remove the flat spring on the slide.

Step 3. Remove the five pan head screws attaching one-half of the stop assembly to the drawer.

Step 4. Loosen the two front screws holding the slide to the equipment cabinet.

Step 5. Using an offset, cross-slotted screwdriver, loosen and remove the two rear screws and attaching hardware.

Step 6. Remove the two screws and hardware from the front of the slide, and remove the slide. Be careful not to damage any cables or wiring.

Step 7. Replace the slide assembly by reversing the removal procedures.

5.3.1.15 Combiner Assembly

To repair the four-channel combiner assembly, proceed in the following manner.

WARNING

> Remove all rf input and output cables from the cabinet(s) and 115 volt ac power at the source before proceeding.

Step 1. Remove the rear cover from the electrical equipment cabinet and retain the hardware.

Step 2. Remove all four antenna coupler drawer assemblies in accordance with paragraph 5.3.1.1.

WARNING

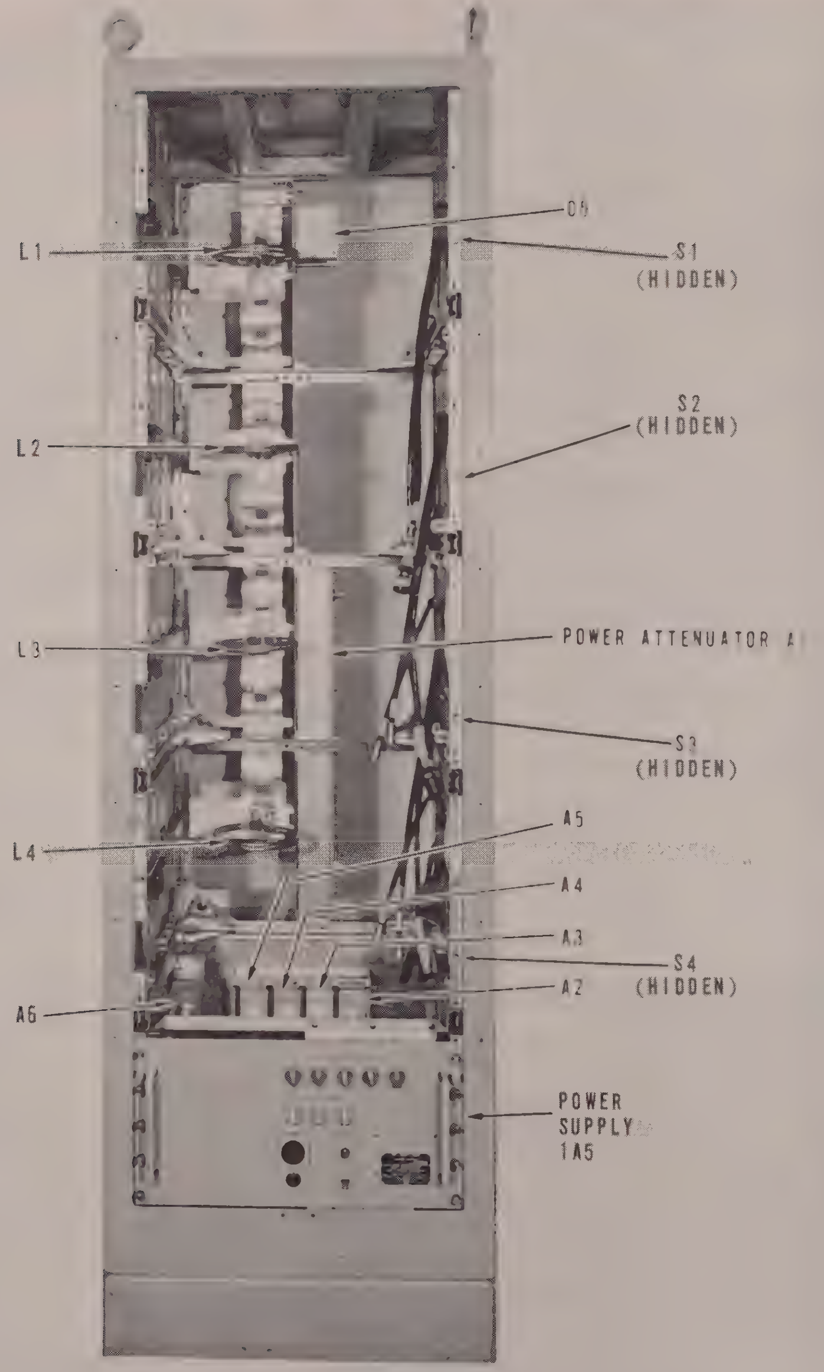
> Short all output coupling links to chassis ground before proceeding.

Step 3. Repair combiner by replacing any defective component (see figures 5-24 through 5-26 and 5-37 through 5-39 for location of components).

Note

> Do not remove entire combiner unless absolutely necessary. All components are accessible from the front or rear of cabinet. Removal and replacement of the entire combiner assembly may cause serious misalignment.

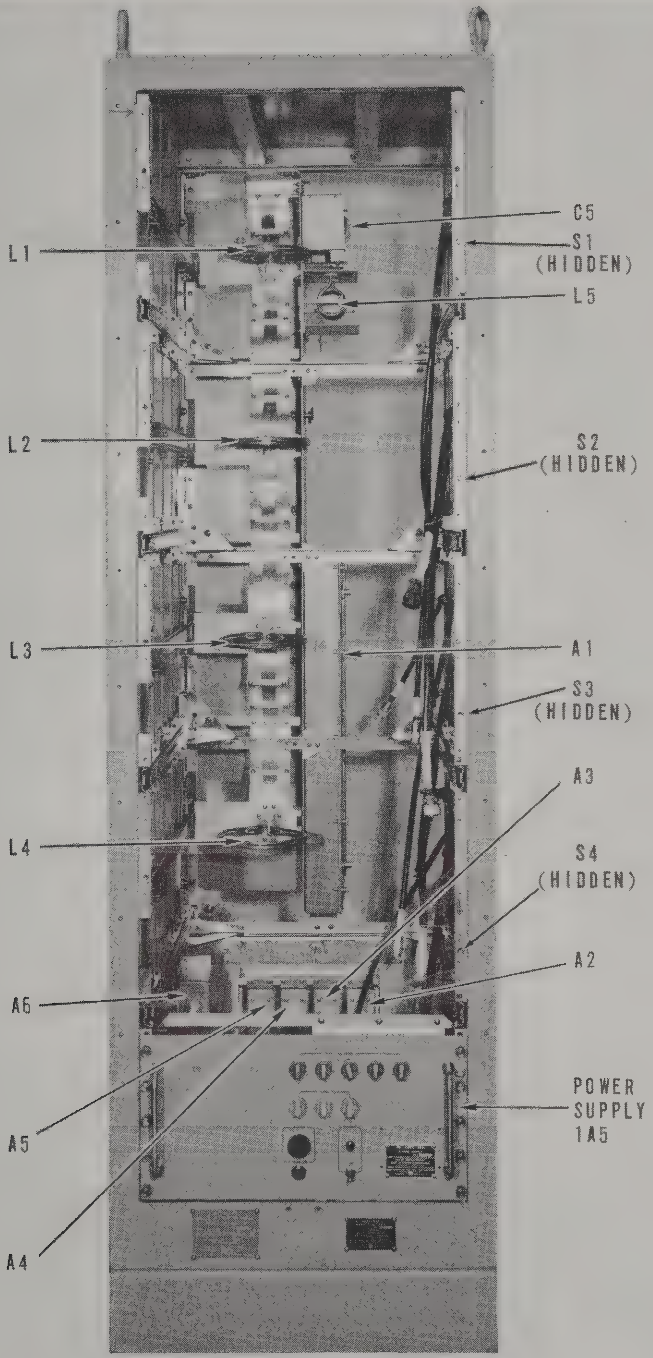
Step 4. Replace antenna coupler drawer assemblies and rear covers by reversing the removal procedures.


C6
L1
S1
(HIDDEN)
S2
(HIDDEN)
L2
L3
POWER ATTENUATOR A1
S3
(HIDDEN)
A5
L4
A4
A3
S4
(HIDDEN)
A2
A6
POWER
SUPPLY
1A5

REF DESIG PREFIX 1A6

80119-044

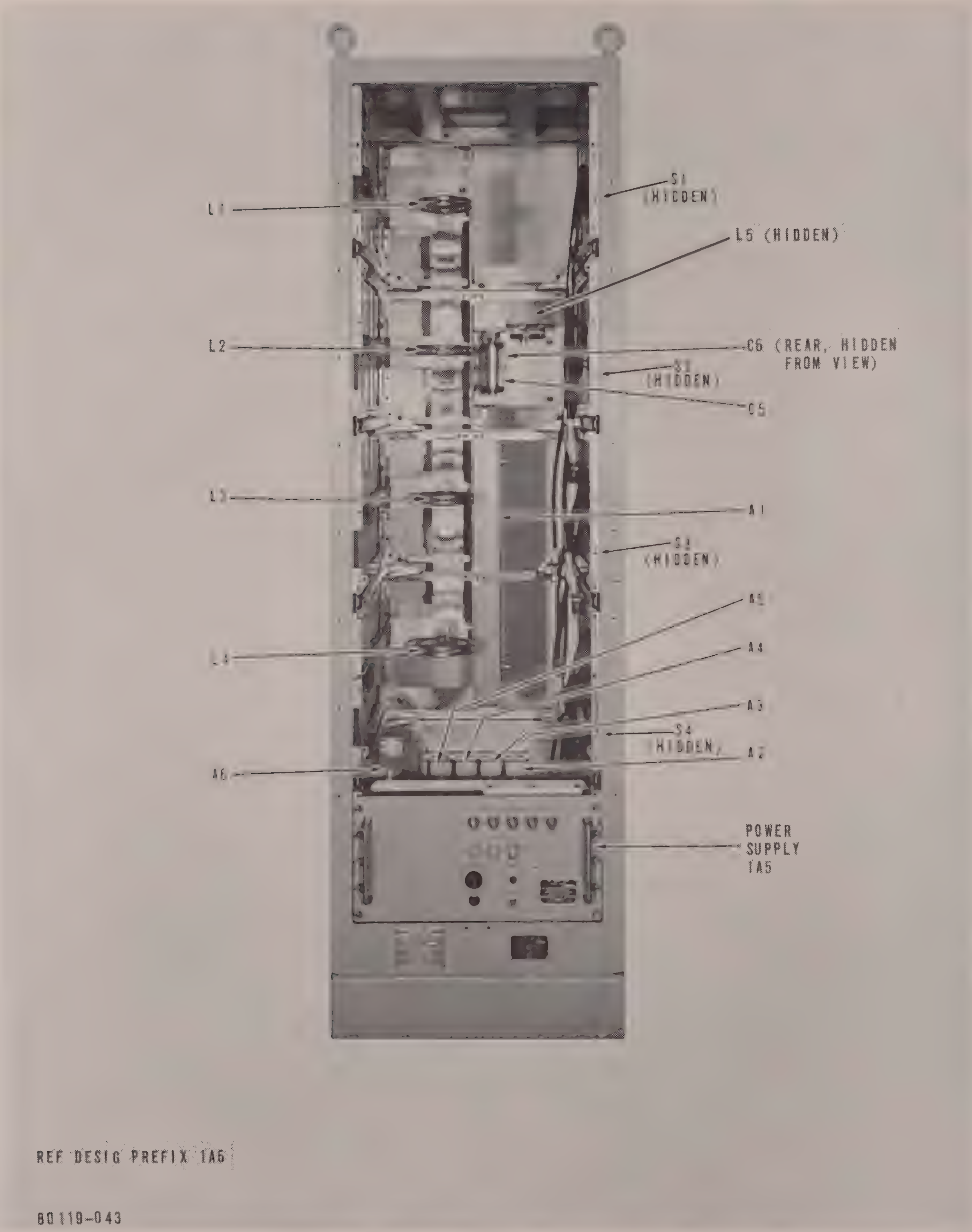
Figure 5-37. Electrical Equipment Cabinet CY-6422/SRA-56, Front View, Location of Components


C5
S1 (HIDDEN)
L1
L5
L2
S2 (HIDDEN)
L3
A1
S3 (HIDDEN)
A3
L4
S4 (HIDDEN)
A2
A6
A5
POWER SUPPLY 1A5
A4

REF DESIG PREFIX 1A6

80119-045

Figure 5-38. Electrical Equipment Cabinet CY-6423/SRA-57, Front View, Location of Components


S1
(HIDDEN)
L1
L5 (HIDDEN)
L2
C6 (REAR, HIDDEN
FROM VIEW)
S2
(HIDDEN)
C5
L3
A1
S3
(HIDDEN)
A5
L4
A4
A3
S4
(HIDDEN)
A2
A6
POWER
SUPPLY
1A5

REF DESIG PREFIX 1A5

80119-043

Figure 5-39. Electrical Equipment Cabinet CY-6424/SRA-58, Front View, Location of Components

5.3.1.16 Impedance Matching Network CU-1773/SRA-56 and CU-1775/SRA-57

To remove, repair, or replace an impedance matching network, proceed in the following manner.

WARNING

> Remove all rf input cables from the equipment cabinet(s) and 115-volt ac power at the source before proceeding.

Step 1. Remove rf output cable from connector 1J1 (see figure 5-40 for location of connector 1J1).

Step 2. Remove cover from impedance matching network by removing the 14 retaining screws, and remove ground lead to connect 1J1.

Step 3. Repair the impedance matching network by replacing any defective components (see figures 5-41 and 5-42 for location of components).

Note

> If only repair is required, no further removal procedures are necessary. All impedance matching network components are accessible when the cover is removed. If the impedance matching network is to be removed completely from the units, proceed with step 4.

Step 4. Remove the straps between the chassis of the impedance matching network and the lower end connector of 1A6J1 on each cabinet. Retain the mounting hardware.

WARNING

> Have two men support the impedance matching network when removing it from the cabinet.

Step 5. Disconnect 1P2 and 1P3 from connectors 1A6J1 on each equipment cabinet and remove the mounting screws.

Step 6. Lift the impedance matching network from the cabinets.

Step 7. Replace the impedance matching network by reversing the removal procedures.

5.3.1.17 Other Assemblies and Components

The removal, repair, and replacement procedures for all other components within the antenna coupler group are obvious by inspection. The location of all remaining assemblies and components (except the control board) is shown in figures previously referenced. The location of components for circuit control board 1A-A1 is shown in figures 5-43 through 5-45.

5.3.2 Emergency Maintenance Procedures

The emergency maintenance procedures for Antenna Coupler Groups AN/SRA-56, -57, and -58 are restricted to the substitution of interchangeable assemblies, subassemblies, or components.

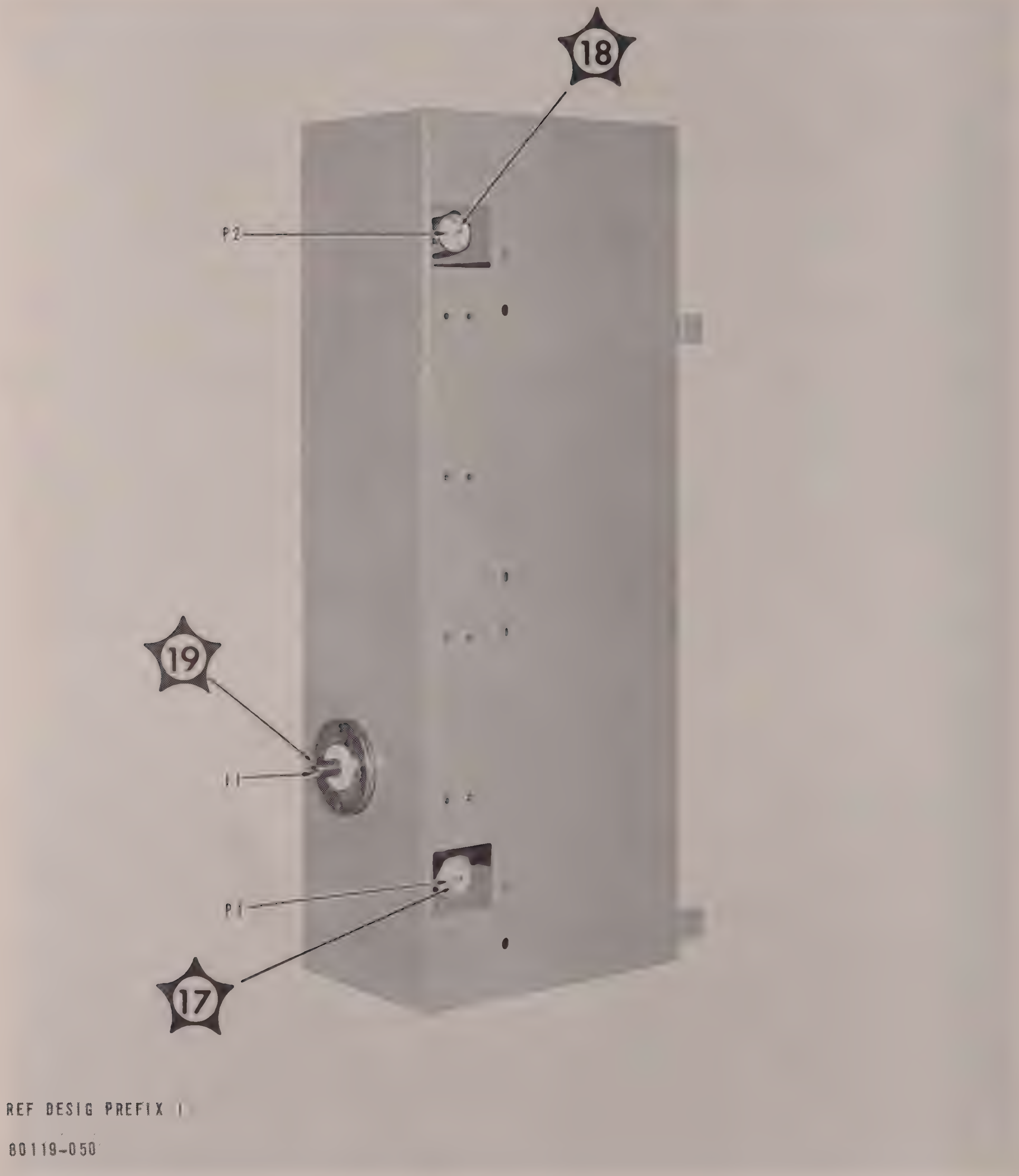

18
P2
19
J1
P1
17
REF DESIG PREFIX 1
80119-050

Figure 5-40. Impedance Matching Network (Typical) Front View, Location of Components

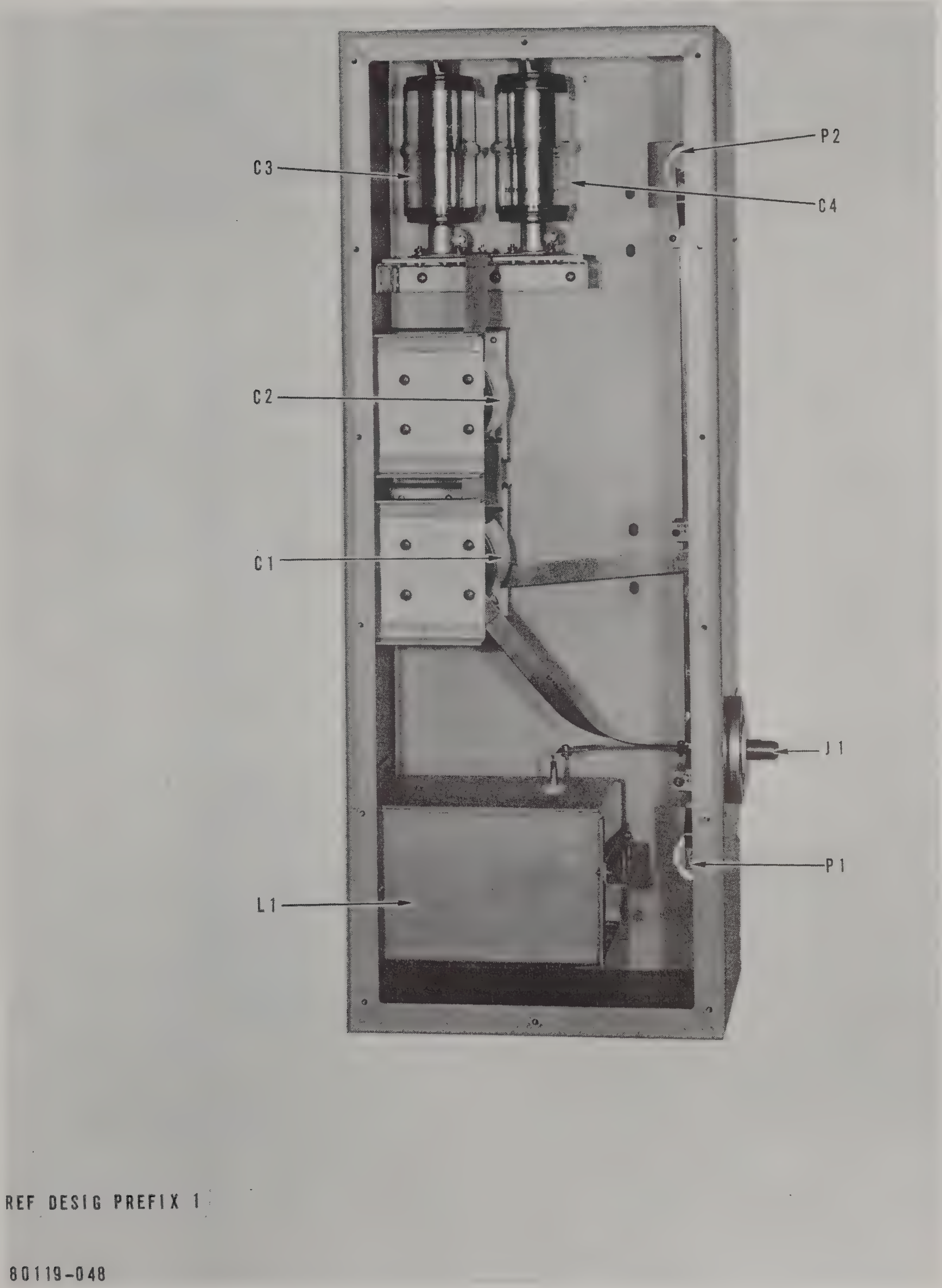

P2
C3
C4
C2
C1
J1
P1
L1
REF DESIG PREFIX 1
80119-048

Figure 5-41. Impedance Matching Network CU-1773/SRA-56, Rear View, Location of Components

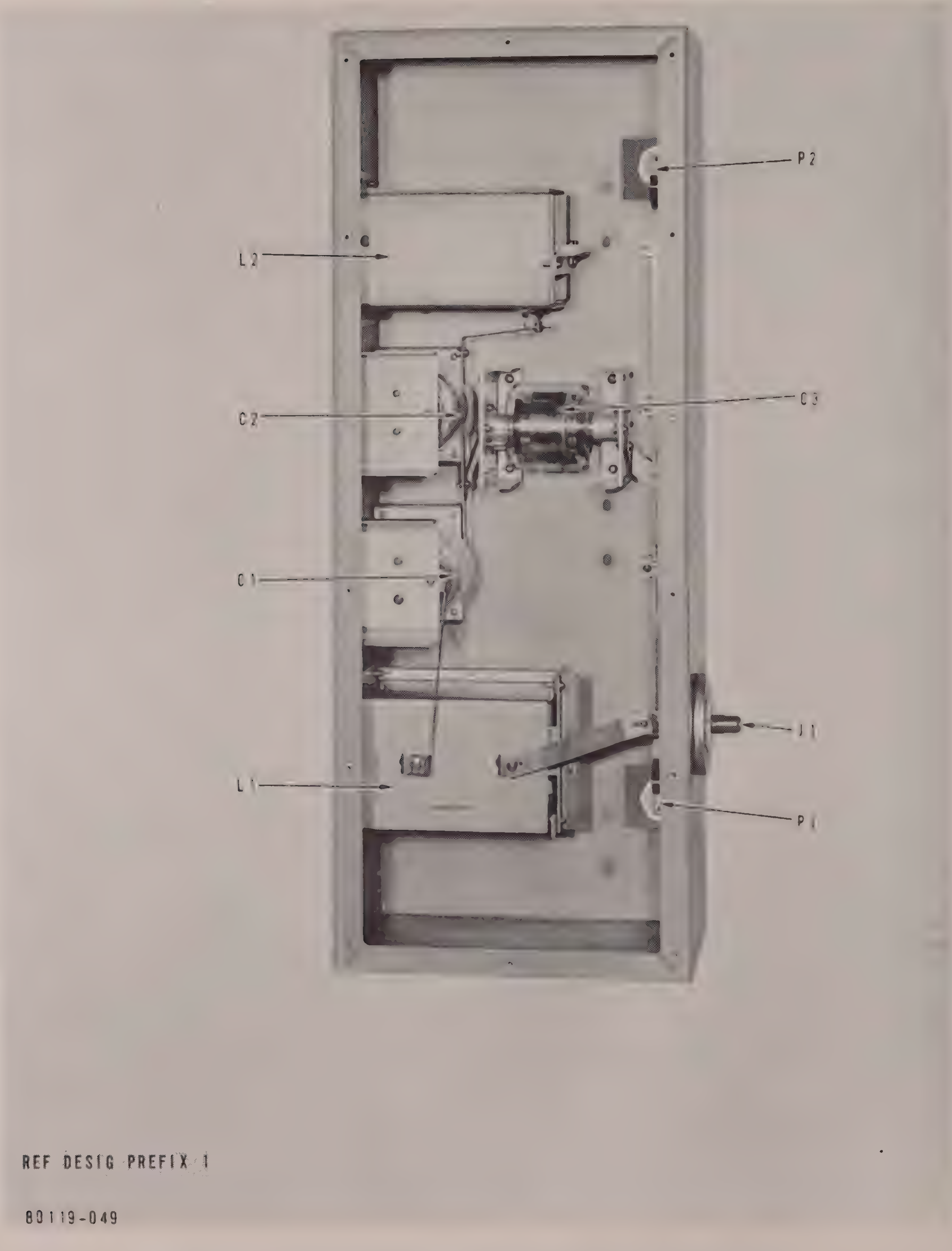

P2
L2
C2
C3
C1
J1
L1
P1
REF DESIG PREFIX 1
80119-049

Figure 5-42. Impedance Matching Network CU-1775/SRA-57, Rear View, Location of Components

Within coupler groups of the same nomenclature (frequency range), all antenna coupler drawer assemblies, electronic Q assemblies, combiner assemblies, impedance matching networks, and associated components of these assemblies are interchangeable. Thus, in an emergency, any of these assemblies or components may be removed from an assembly not in use, or one handling lower priority traffic, and installed on another unit or assembly that must be maintained in operation. For example, the electronic Q assembly from one Antenna Coupler CU-1772/SRA-56 can be substituted in another Antenna Coupler CU-1772/SRA-56 without affecting the operating characteristics of the Antenna Coupler Group AN/SRA-56, provided that the required rf measurement and alignment procedures are performed.

Within all three antenna coupler groups, all power supply panels (1A5), circuit control boards (1A-A1), voltage sensors (1A-A2, 1A-A3), shorting relay assemblies (1A-A5), power attenuators (1A6A1), operate reflectometers (1A6A2, -A3, -A4, -A5), tune reflectometers (1A6A6), rf relay assemblies (1A6A7), and associated components of these are completely interchangeable. Substitution of one assembly, device, or component for another will have no effect on the performance of any antenna coupler group. For example, the rf relay assembly can be removed from Antenna Coupler Group AN/SRA-56 and installed in Antenna Coupler Group AN/SRA-58 without affecting the operating characteristics of Antenna Coupler Group AN/SRA-58.

Under an emergency condition, it is also possible to install circuit control boards, reflectometers, and voltage sensors that have not been calibrated, or other assemblies or components whose performance is marginal, provided that operating procedures are modified to compensate for the differences in operating characteristics. However, such procedures are not recommended and should be used only in an emergency. Exercise extreme care and caution when operating in this mode, and be prepared to shut down the equipment immediately if trouble arises. Repair and restore the equipment to its normal condition at the first opportunity.

5.4 MAINTENANCE DATA

The following information contains maintenance data to be used as an aid in troubleshooting or repair of the antenna coupler groups. This data is in the form of wire-running lists and maintenance diagrams. Consult this data as required when troubleshooting or performing maintenance of the equipment.

5.4.1 Wire Running List

Table 5-20 contains the intrarack wiring connnections for the antenna coupler groups. Except as specified through the use of notes, the wiring connections are identical for all antenna coupler drawer assemblies, power supply assemblies, electrical equipment cabinets and coupler groups. The table is followed by related notes and an item identification chart that defines the termination code and the wire codes used throughout the list.

5.4.2 Interconnection, Power Distribution, and Schematic Diagrams

Figure 5-48 is an interconnection diagram that contains information required to connect transmitter rf, interlock, and key line circuits to an antenna coupler group, and an additional circuit that may be used to establish a remote alarm silencer capability. Figure 5-49 is a power distribution diagram that shows the routing and connections for ac and dc power distribution within an antenna coupler group. Figures 5-50 and 5-51 are detailed schematic diagrams of the antenna coupler groups, antenna couplers and associated assemblies, and impedance matching networks.

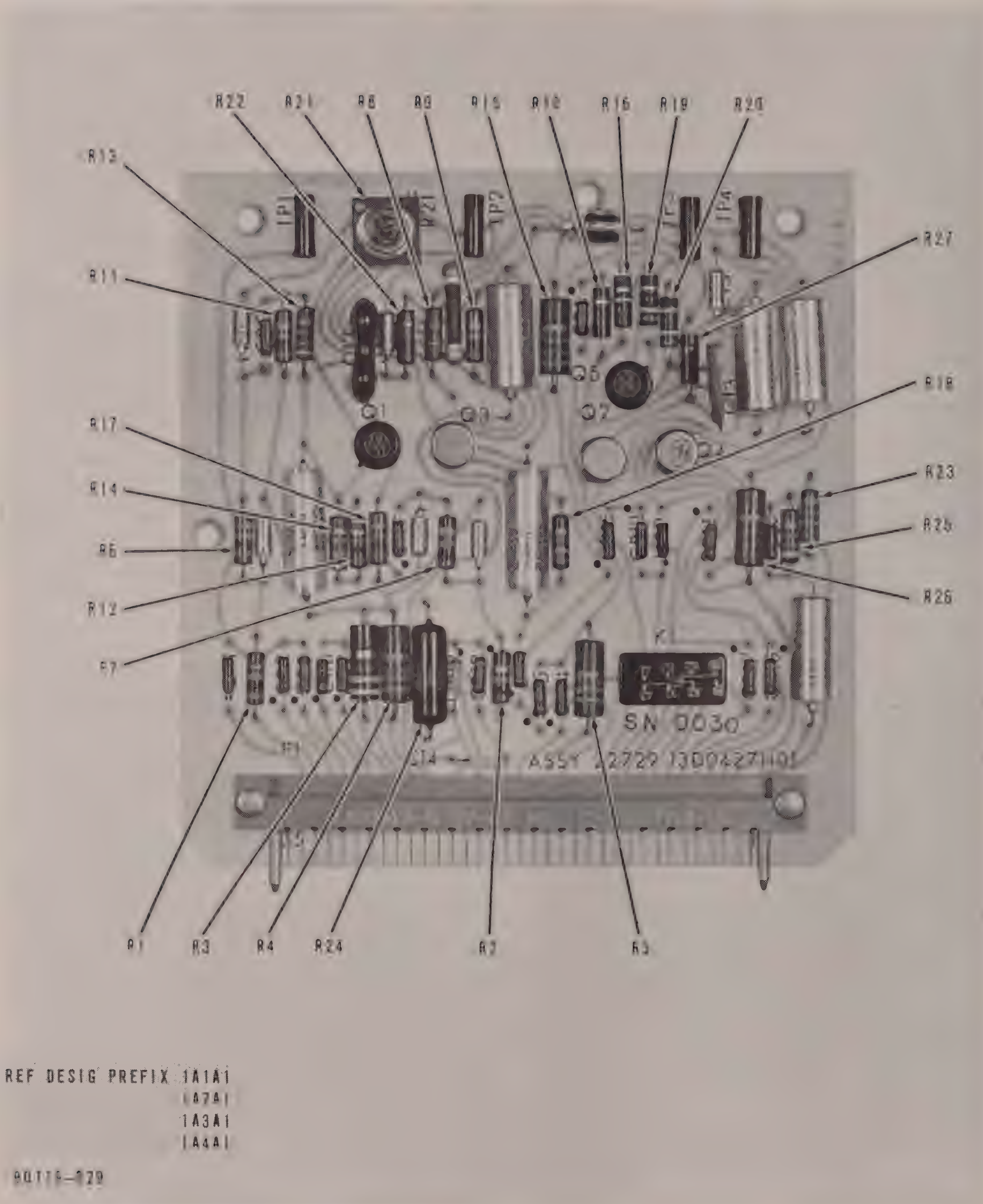
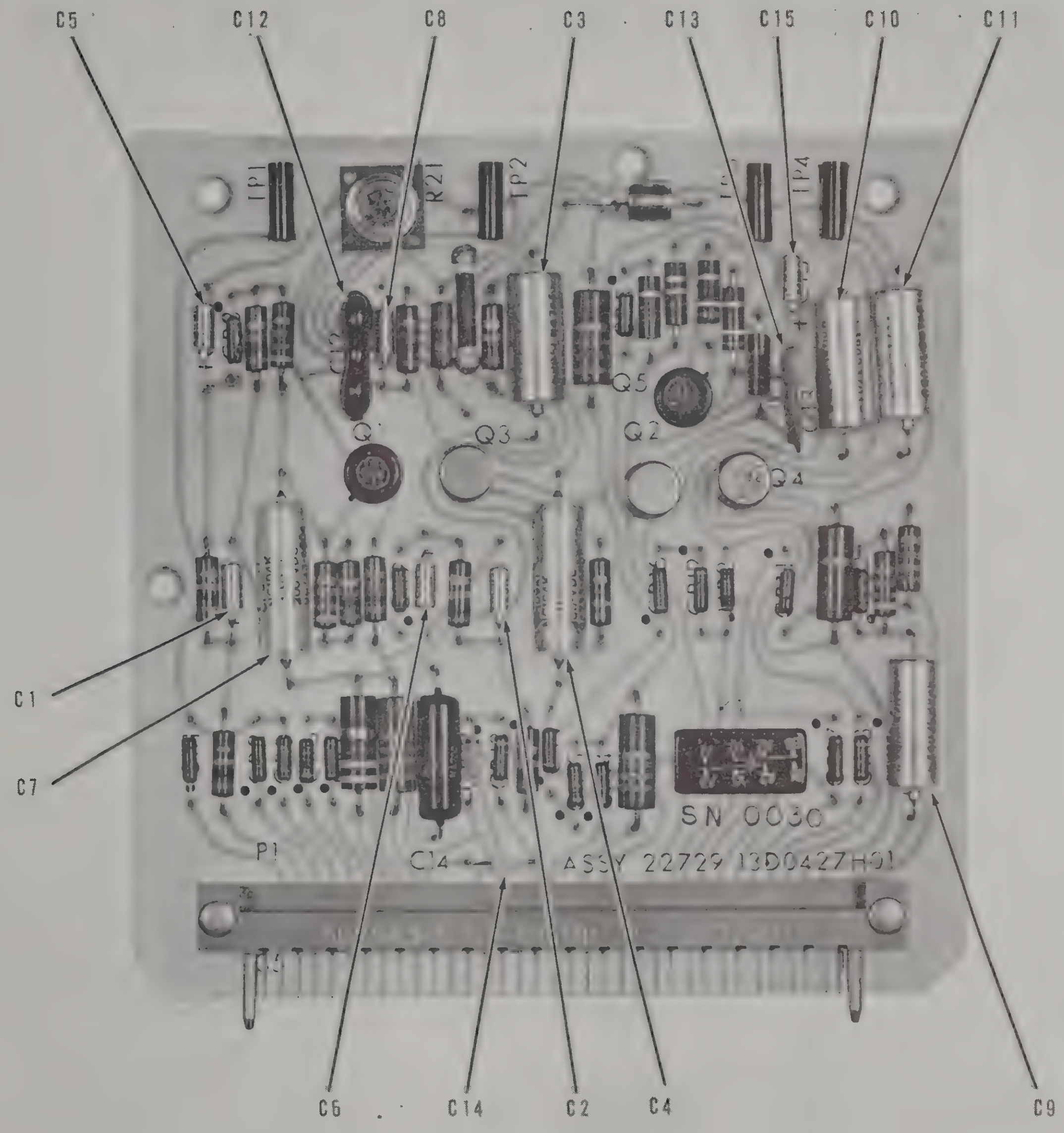

R22
R21
R8
R9
R15
R10
R16
R19
R20
R13
R27
R11
R18
R17
R23
R14
R6
R25
R12
R26
R7
SN 0030
ASSY 22729 1300427H01
R1
R3
R4
R24
R2
R5
REF DESIG PREFIX 1A1A1
1A2A1
1A3A1
1A4A1
90TT6-929

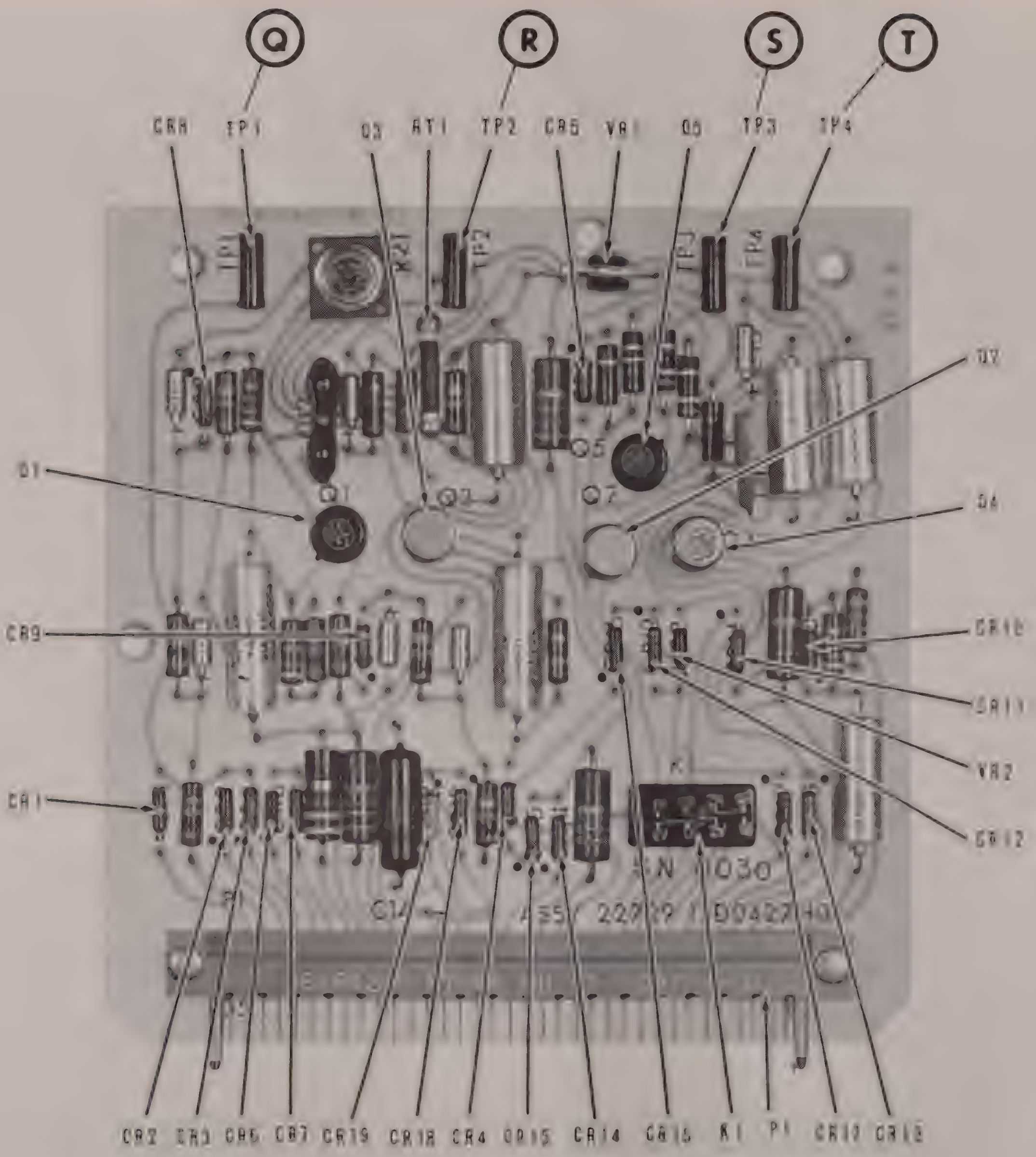
Figure 5-43. Circuit Control Board, Location of Resistors


C5
C12
C8
C3
C13
C15
C10
C11
C1
C7
C6
C14
C2
C4
C9
TP1
R21
TP2
TP4
C12
Q5
Q1
Q3
Q2
Q4
SN 0030
P1
C14
ASSY 22729 13D0427H01

REF DESIG PREFIX 1A1A1
1A2A1
1A3A1
1A4A1

80119-022

Figure 5-44. Circuit Control Board, Location of Capacitors


Q
R
S
T
CR8
TP1
Q3
RT1
TP2
CR5
VR1
Q5
TP3
TP4
Q7
Q1
Q4
CR9
CR16
CR11
VR2
CR12
CR1
CR2
CR3
CR6
CR7
CR19
CR18
CR4
CR15
CR14
CR13
K1
P1
CR10
CR17

REF DESIG PREFIX 1A1A1
1A2A1
1A3A1
1A4A1

80119-021

Figure 5-45. Circuit Control Board, Location of Diode, Transistors, Relay Test Parts and Miscellaneous Components

TABLE 5-20 WIRE RUNNING LIST

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
ELECTRICAL EQUIPMENT CABINET 1A6					
1	FL1	A1	P11	A	5, 10
2	FL1	A2	P11	B	5, 10
3	P11	C	TB2	14	5
4	TB1	17	P11	D	4, 11
5	FL1	B1	S5A	C	5, 10
6	FL1	B2	S5B	C	5, 10
7	P1	F	S1	C	4
8	P1	G	TB3	2	4
9	P1	H	P11	E	3
10	P1	J	TB1	1	4
11	P1	K	TB2	8	4
12	P1	L	TB3	9	4
13	P1	M	TB3	10	4
14	P1	N	P10	A	4
15	P1	P	TB1	3	4
16	P1	R	TB1	5	4
17	P1	S	TB1	7	4
18	P1	T	TB1	9	2

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
ELECTRICAL EQUIPMENT CABINET (Continued)					
19	P11	J	TB2	8	4
20	P1	X	TB2	12	4
21	P2	F	S2	C	4
22	P2	G	TB3	4	4
23	P2	H	P11	F	3
24	P11	K	TB3	17	4
25	P11	L	TB1	14	2
26	C1	2	TB1	17	4, 9
27	C2	2	C1	2	4, 9
28	C2	2	C3	2	4, 9
29	P2	J	TB1	3	4
30	S5A	NO	TB2	15	5
31	S5B	NO	TB2	16	5
32	S1	NO	TB3	1	4
33	P2	K	TB2	9	4
34	S2	NO	TB3	3	4
35	P1	Y	TB1	15	4
	P1	Z			2, SHIELD GND. ITEMS 93 THRU 97

TABLE 5-20 WIRE RUNNING LIST (Continued)

ELECTRICAL EQUIPMENT CABINET (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
36	S3	NO	TB3	5	4
37	P2	L	TB3	11	4
38	S4	NO	TB3	7	4
39	P2	M	TB3	12	4
40	P2	N	P10	B	4
41	P2	P	TB1	1	4
42	P2	R	TB1	5	4
43	P2	S	TB1	7	4
44	P2	T	TB1	9	2
45	P2	W	C2	1	4, 10
46	P2	X	TB2	12	4
47	P2	Y	TB1	15	4
	P2	Z			2, SHIELD GND. ITEMS 90, 91, 92, 98, 99
48	P3	F	S3	C	4
49	P3	G	TB3	6	4
50	P3	H	P11	G	3
51	P3	J	TB1	6	4
52	P3	K	TB3	9	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

ELECTRICAL EQUIPMENT CABINET (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
53	P3	L	TB3	13	4
54	P3	M	TB3	14	4
55	P3	N	P10	C	4
56	P3	P	TB1	2	4
57	P3	R	TB1	4	4
58	P3	S	TB1	8	4
59	P3	T	TB1	10	2
60	P10	E	TB1	11	2
61	P3	X	TB2	13	4
62	P3	Y	TB1	16	4
	P3	Z			2, SHIELD GND. ITEMS 87, 88, 89, 100, 101
63	P4	F	S4	C	4
64	TB1	11	TB2	4	2, 11
65	P4	G	TB3	8	4
66	P4	H	P11	H	3
67	P4	J	TB1	8	4
68	P4	K	TB2	10	4
69	P4	L	TB3	15	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

ELECTRICAL EQUIPMENT CABINET (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
70	P4	M	TB3	16	4
71	P4	N	P10	D	4
72	P4	T	TB1	10	2
73	P4	W	C4	1	4, 9
74	P4	X	TB2	13	4
75	P4	Y	TB1	16	4
	P4	Z			2, SHIELD GND. ITEMS 84, 85, 86, 102, 103
76	P9	B	TB2	5	4
77	P9	C	TB2	1	4
78	C3	1	P3	W	4, 9
79	C1	1	P1	W	4, 9
80	TB2	3	P4	D	1, 11
	TB2	4			2, SHIELD GND. ITEMS 76, 77, 96 THRU 103
81	P4	S	TB1	6	4
82	P4	P	TB1	2	4
83	P4	R	TB1	4	4
84	P4	A	P8	A	1
85	P4	B	P8	B	1

TABLE 5-20 WIRE RUNNING LIST (Continued)

ELECTRICAL EQUIPMENT CABINET (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
86	P4	C	P8	C	1
87	P3	A	P7	A	1
88	P3	B	P7	B	1
89	P3	C	P7	C	1
90	P2	A	P6	A	1
91	P2	B	P6	B	1
92	P2	C	P6	C	1
93	P1	A	P5	A	1
94	P1	B	P5	B	1
95	P1	C	P5	C	1
96	P1	D	TB2	1	1
97	P1	E	TB2	5	1
98	P2	D	TB2	2	1
99	P2	E	TB2	6	1
100	P3	D	TB2	2	1
101	P3	E	TB2	6	1
102	TB2	11	TB3	18	4, 11
103	P4	E	TB2	7	1

TABLE 5-20 WIRE RUNNING LIST (Continued)

ELECTRICAL EQUIPMENT CABINET (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
104	C3	2	C4	2	4, 9
105	TB1	12	E1		GND
106	TB2	17	E1		GND POWER SUPPLY COMMON

OPERATE REFLECTOMETER 1A6A2, 1A6A3, 1A6A4, 1A6A5

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
1	A2	E2	J3	A	4
2	A2	E4	J3	B	2
3	A2	E6	J3	C	4
4A	A1	E3	A2	E3	1
4B	E2		E4	-	BRAID OF WIRE 4A
5	A2	E5	E5	-	6
6	A2	E1	E1	-	6
7	A2	E4	E4	-	6
8	A1	E1	E3	-	6
9	A1	E2	E6	-	6
10	E3		T1	BROWN	6
11	E2		T1	RED	6
12	E4	-	T1	ORANGE	6
13	E5	-	T1	YELLOW	6

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
RF RELAY ASSEMBLY 1A6A7					
1	J11	A	K5	2	3
2	J11	B	K6	2	3
3	J11	C	K7	2	3
4	J11	D	K8	2	3
5	J11	E	K4	1	2
6	K3	1	K4	1	2
7	K2	1	K3	1	2
8	K2	1	K1	1	2
9	K1	1	K5	1	2
10	K5	1	K6	1	2
11	K6	1	K7	1	2
12	K7	1	K8	1	2
13	K4	2	K8	2	3
14	K3	2	K7	2	3
15	K2	2	K6	2	3
16	K1	2	K5	2	3
TUNE REFLECTOMETER 1A6A6					
1	A1	E3	J3	B	2
2		E4	J3	C	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

TUNE REFLECTOMETER (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
3A	A1	E3	E3		1
3B	E2	-	E4	-	BRAID OF WIRE 3A
4	A1	E2	E5	-	6
5	A1	E1	E1	-	6
6	E2		T1	RED	6
7	E3	-	T1	BROWN	6
8	E4	-	T1	ORANGE	
9	E5		T1	YELLOW	6

ANTENNA COUPLER DRAWER ASSEMBLY 1A1, 1A2, 1A3, 1A4

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
1	A6S1C2	10	J1	E	1
2	J1	B	M1	(-)	1, SEE FIGURE 5-46
3	A6S1C2	11	M1	(-)	1, SEE FIGURE 5-46
4	M1	(+)	J1	A	1, SEE FIGURE 5-46
5	A6S1C1	4	J1	D	1
6	J1	C	XA1	19	1
7	J1	F	XA1	12	4
8	J1	G	XA1	8	4
9	J1	P	XA1	34	4
10	J1	R	XA1	32	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
ANTENNA COUPLER DRAWER ASSEMBLY (Continued)					
11	J1	S	XA1	31	4
12	A6S1B1	C1	J1	H	3
13	A6S1B1	C1	XDS2	1	3, SEE FIGURE 5-46
14	XA1	2	XDS2	1	3, SEE FIGURE 5-46
15	J1	K	XA1	18	4
16	A6S1A2	10	E5ATXA1	-	4
17	A6S1A1	2	J1	N	4
18	A6S1A1	2	XA1	30	4
19	A6S2	1	J1	L	4, SEE FIGURE 5-46
20	A6S2	2	J1	M	4, SEE FIGURE 5-46
21	A5K1	1	J1	T	2
22	A3	E1	XA1	25	2
23	A3	E1	R1	2	2, 12
24	R1	2	R2	2	2, 12
25	J1	X	P1	D	4
26	J1	J	XA1	1	4
27	J1	Y	P1	C	4
28	P1	B	J1	W	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
ANTENNA COUPLER DRAWER ASSEMBLY (Continued)					
29	A6S1C2	C2	M2	(-)	1, SEE FIGURE 5-46
30	M2	(+)	A6S1C1	C1	1, SEE FIGURE 5-46
31	A6S1B2	C2	XA1	5	4
32	A6S1A2	C2	S3A3		4, SEE FIGURE 5-46
33	A6S1A1	C1	XA1	6	
34	A2	E1	A6S1C2	8	1
35	A6S1B1	5	S2	1	4
36	A2	E1	XA1	23	1
37	A2	E2	A6S1C1	2	1
38	A6S1C1	5	XA1	21	1
39	A6S1B2	8	S1	NC	4
40	A6S1B2	11	S1	NO	4
41	A6S1B1	2	XA1	9	4
42	A6S1B1	3	S1	COM	4
43	A6S1B1	4	XDS1	1	4
44	A6S1B1	5	XA1	11	4
45	S3B	1	XDS2	2	4, SEE FIGURE 5-46
46	A6S1A1	3	XA1	27	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

ANTENNA COUPLER DRAWER ASSEMBLY (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
47	A5K1	2	A6S1A1	5	4
48	A5K1	2	XA1	29	4
49	R1	1	XA1	7	4, 12
50	R1	1	XDS1	2	4, 12, SEE FIGURE 5-46
51	XDS1	2	XDS4	1	4, SEE FIGURE 5-46
52	A3	E2	XA1	33	1
53	XA1	16	XDS3	1	4, SEE FIGURE 5-46
54	S2	3	XDS3	2	2, SEE FIGURE 5-46
55	XA1	28	XDS4	2	4, SEE FIGURE 5-46
56	A6S1A1	3	A6S1A1	4	6
57	S2	2	XA1	10	4
58	S3A	2	XA1	15	4, SEE FIGURE 5-46
59	S3B	2	XA1	26	4, SEE FIGURE 5-46
60	R2	1	S3A	3	4, SEE FIGURE 5-46
61	R2	1	XA1	4	4, 12
62	E1ATJ1		J1	Z	2
63	A6S1C2	11	A6S1C2	9	6
64	A6S1A2	8	A6S1A2	9	6

TABLE 5-20 WIRE RUNNING LIST (Continued)

ANTENNA COUPLER DRAWER ASSEMBLY (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
65	E1ATJ1				2, SHIELD ITEM 4
66	E1ATJ1				2, SHIELD ITEM 2
67	E1ATJ1				2, SHIELD ITEM 6
68	E1ATJ1				2, SHIELD ITEM 5
69	A1ATJ1				2, SHIELD ITEM 1
70	E3ATA6S1				2, SHIELD ITEM 1
71	E3ATA6S1				2, SHIELD ITEM 2
72	E3ATA6S1				2, SHIELD ITEM 3
73	E3ATA6S1				2, SHIELD ITEM 4
74	E3ATA6S1				2, SHIELD ITEM 5
75	E2ATXA1				2, SHIELD ITEM 6
76	E3ATA6S1				2, SHIELD ITEM 29
77	E4ATM2				2, SHEILD ITEM 29
78	E3ATA6S1				2, SHIELD ITEM 30
79	E4ATM2				2, SHIELD ITEM 30
80	E3ATA6S1				2, SHIELD ITEM 34
81	A2	E3			2, SHIELD ITEM 34
82	A6S1A2	9	A6S1A2	10	6

TABLE 5-20 WIRE RUNNING LIST (Continued)

ANTENNA COUPLER DRAWER ASSEMBLY (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
83	A6S1C2	9	A6S1C2	8	6
84	A2	E3			2, SHIELD ITEM 36
85	E2ATXA1				2, SHIELD ITEM 36
86	E3ATA6S1				2, SHIELD ITEM 37
87	A2	E3			2, SHIELD ITEM 37
88	A6S1B1	3	A6S1B1	4	6
89	E2ATXA1				2, SHIELD ITEM 38
90	A6S1B1	4	A6S1B1	5	6
91	E2ATXA1				2, SHIELD ITEM 52
92	A3	E3			2, SHIELD ITEM 52
93	A3	E1	A5K1	1	2
94	A6S1B2	8	A6S1B2	9	6
95	A6S1C1	2	A6S1C1	3	6
96	R2	2	S2	3	2, 12
97	E3ATA6S1				2, SHIELD ITEM 3
98					
99	E6ATXA1		XA1	3	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
POWER SUPPLY PANEL 1A5					
1	J1	A	XF2	1	5
2	J1	B	XF1	1	5
3	J1	C	T1	2	5
4	J1	D	T1	1	5
5	J1	E	XF3	2	8
6	J1	F	XF4	2	8
7	J1	G	XF5	2	8
8	J1	H	XF6	2	8
9	J1	J	S2	4	4
10	J1	K	S2	3	4
11	J1	L	T1	4	7
12	XF1	2	S1	3	5
13	S1	4	XF2	2	5
14	T1	2	S1	1	5
15	XDS1	1	S1	1	4
16	T1	1	S1	2	5
17	XDS1	2	S1	2	4
18	CR1	1	T1	6	8

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
POWER SUPPLY PANEL (Continued)					
19	CR2	1	T1	7	8
20	CR1	2	CR2	2	8
21	C1	POS	CR1	2	8
22	CR2	2	R1	1	8
23	C1	POS	XF3	1	8
24	XF4	1	XF3	1	8
25	XF4	1	XF5	1	8
26	XF5	1	XF6	1	8
27	S2	4	K1	A2	4 See figure 5-47
28	E3	-	S2	3	4 See figure 5-47
29	E3	-	K1	A1	4
30	K1	A1	K1	X1	6
31	DS2	POS	K1	A3	4 See figure 5-47
32	DS2	NEG	E2	-	4 See figure 5-47
33	C1	NEG	T1	4	7
34	C1	NEG	E4	-	7
35	E1	-	E4	-	2
36	E1	-	R1	2	2

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
POWER SUPPLY PANEL (Continued)					
37	E5	-	R1	2	2
38	E5	-	K1	X2	2

NOTES:

1. #22 AWG Shielded (see note 13)
2. #22 AWG Black (see note 14)
3. #22 AWG Red (see note 14)
4. #22 AWG White (see note 14)
5. #20 AWG White (see note 14)
6. #22 AWG Solid, Bare Copper Wire per QQ-W-343, Type S
7. #20 AWG Black (see note 14)
8. #20 AWG Red (see note 14)
9. C1-1, C2-1, C3-1, and C4-1 are terminals toward front of the cabinet
10. FL1-B1 and B2 terminals on right side of filter when viewed from the front of the cabinet
11. Terminals bracketed on TB1 and TB2 are electrically connected by metal straps
12. R1-1 and R2-1 toward right side of drawer when viewing from front
13. Insulation material for wiring listed in note 1 above is polyvinylchloride (PVC) 600 volts RMS with an additional covering of polyamide (nylon) jacket and shield (tinned); plus an outer polyvinylchloride (PVC) jacket (white)
14. Insulation material for wiring listed in notes 2, 3, 4, 5, 7, and 8 above is polyvinylchloride (PVC) 600 volts RMS; also an additional covering of polyamide (nylon) jacket

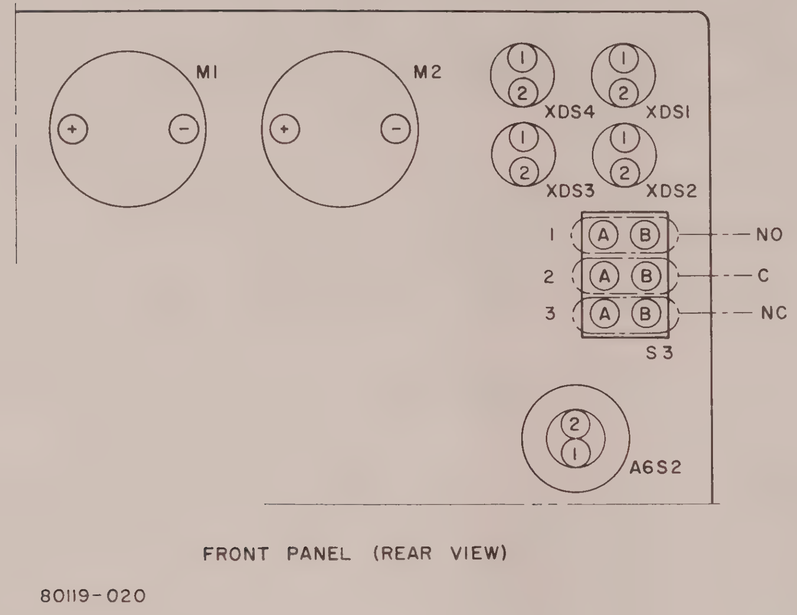

M1
M2
XDS4
XDS1
XDS3
XDS2
1
2
3
A
B
NO
C
NC
S3
A6S2
FRONT PANEL (REAR VIEW)
80119-020

Figure 5-46 Antenna Coupler, Rear View of Front Panel, Location of Terminals

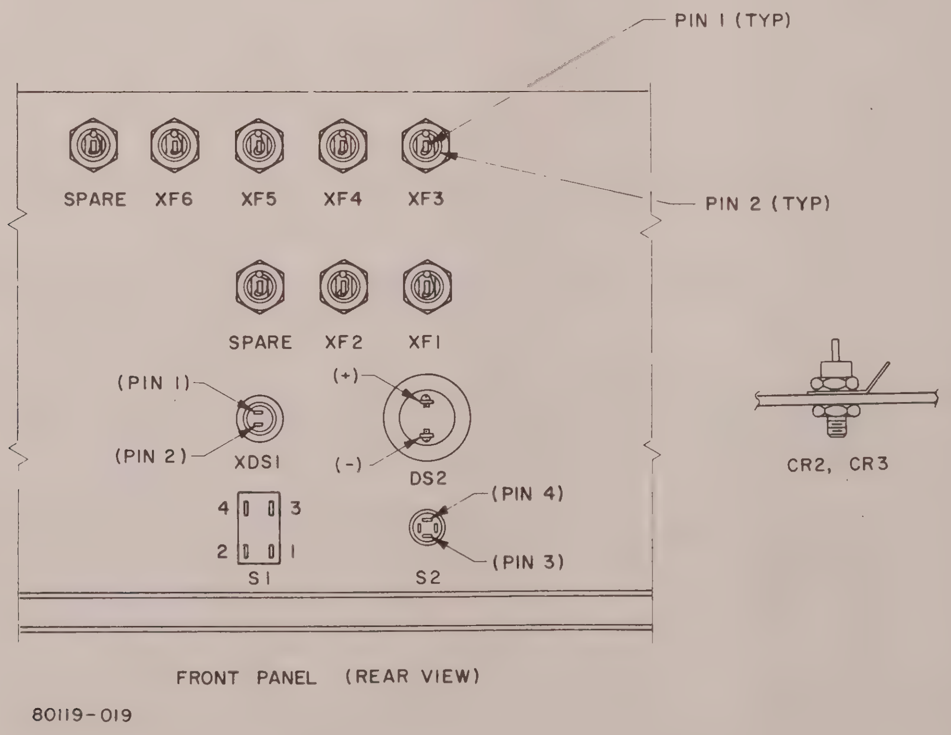

PIN 1 (TYP)
PIN 2 (TYP)
SPARE
XF6
XF5
XF4
XF3
SPARE
XF2
XF1
(PIN 1)
(PIN 2)
XDS1
(+)
(-)
DS2
4
3
2
1
S1
(PIN 4)
(PIN 3)
S2
CR2, CR3
FRONT PANEL (REAR VIEW)
80119-019

Figure 5-47 Power Supply, Rear view of Front Panel, Location of Terminals

NOTES:

1. INTERCONNECTING CABLE GROUPING WILL VARY FOR STALLATION. REFER TO AI DETERMINE CORRECT CABI THE SPECIFIC SHIP.
2. CONNECTORS ARE SUPPLIE OF CABLE ONLY. CONNECT SPECIFIED BY THE SHIPS P

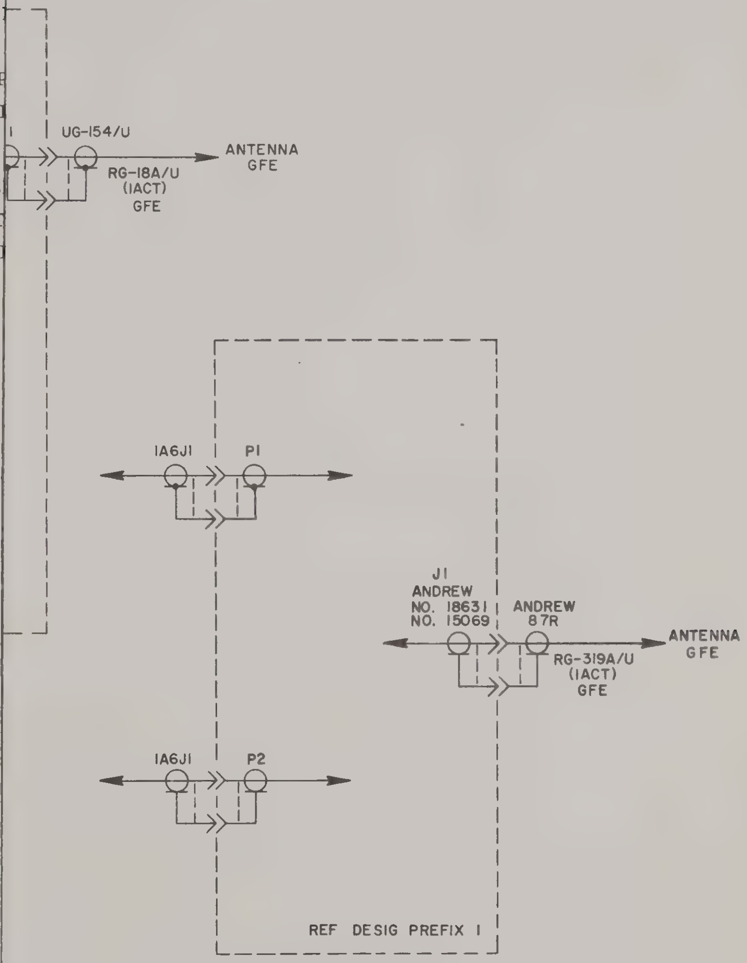

I
UG-154/U
ANTENNA
GFE
RG-18A/U
(1ACT)
GFE
1A6J1
P1
J1
ANDREW
NO. 18631
NO. 15069
ANDREW
87R
ANTENNA
GFE
RG-319A/U
(1ACT)
GFE
1A6J1
P2
REF DESIG PREFIX 1

Figure 5-48 Interconnection Diagram

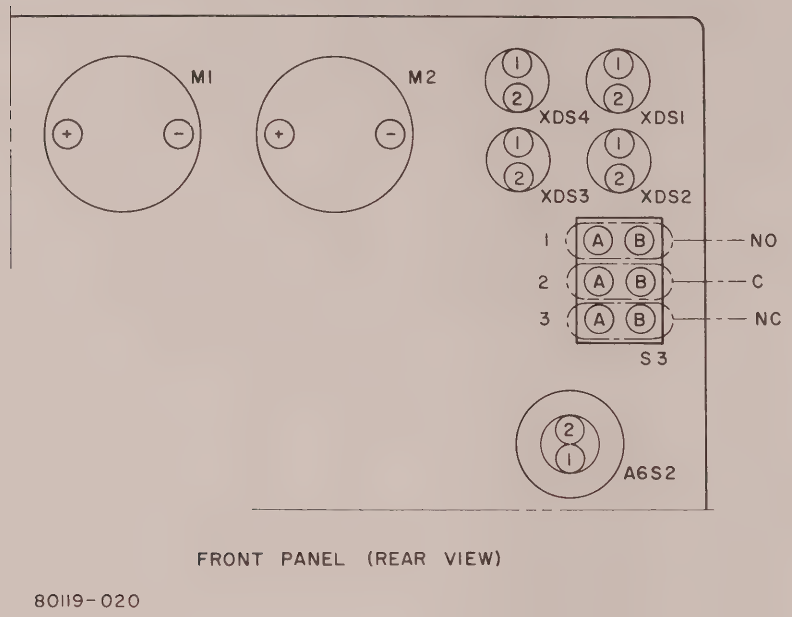

M1
M2
+
-
1
2
XDS4
XDS1
XDS3
XDS2
1
2
3
A
B
NO
C
NC
S3
A6S2
FRONT PANEL (REAR VIEW)
80119-020

Figure 5-46 Antenna Coupler, Rear View of Front Panel, Location of Terminals

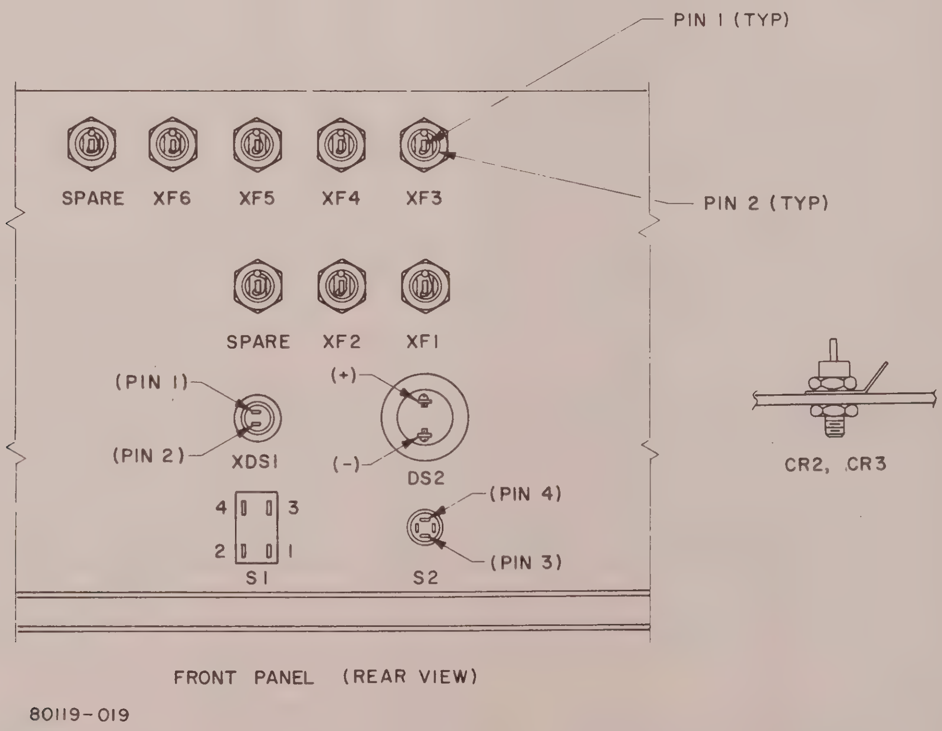

PIN 1 (TYP)
PIN 2 (TYP)
SPARE
XF6
XF5
XF4
XF3
SPARE
XF2
XF1
(PIN 1)
(PIN 2)
XDS1
(+)
(-)
DS2
4
3
2
1
S1
(PIN 4)
(PIN 3)
S2
CR2, CR3
FRONT PANEL (REAR VIEW)
80119-019

Figure 5-47 Power Supply, Rear view of Front Panel, Location of Terminals

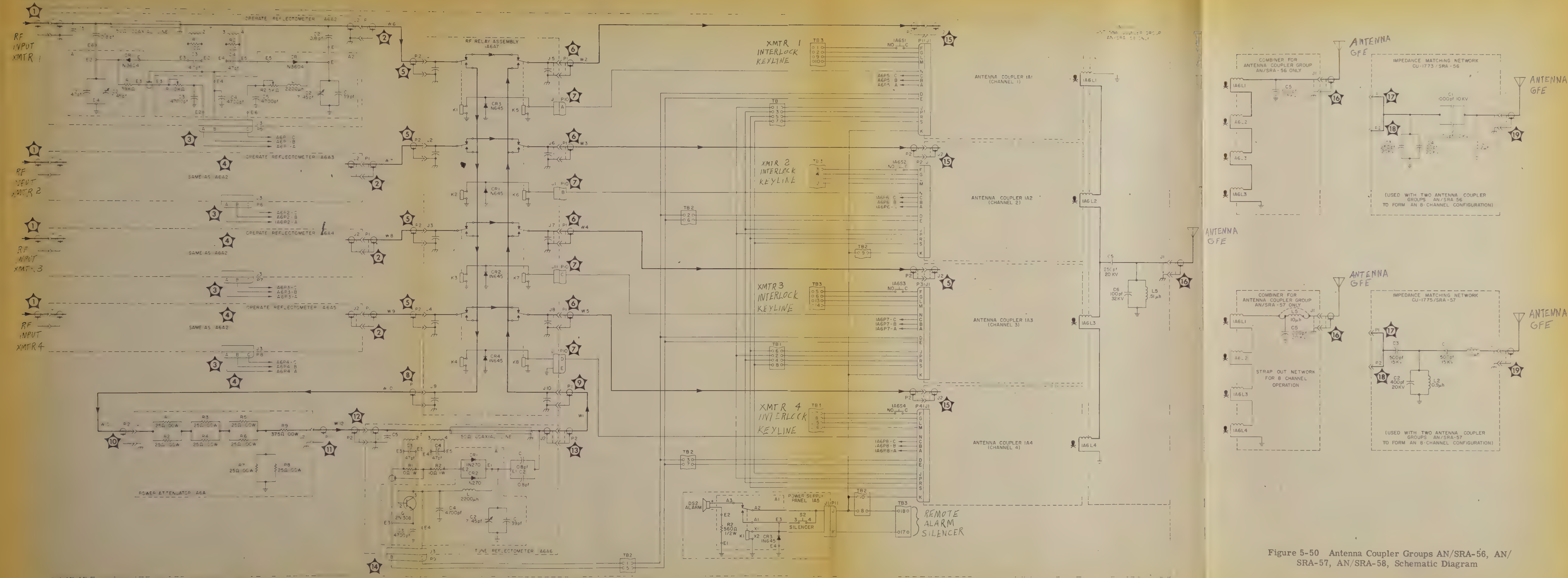

RF INPUT XMTR 1
RF INPUT XMTR 2
RF INPUT XMTR 3
RF INPUT XMTR 4
OPERATE REFLECTOMETER A6A2
OPERATE REFLECTOMETER A6A3
OPERATE REFLECTOMETER A6A4
OPERATE REFLECTOMETER A6A5
SAME AS A6A2
RF RELAY ASSEMBLY 1A6A7
XMTR 1 INTERLOCK KEYLINE
XMTR 2 INTERLOCK KEYLINE
XMTR 3 INTERLOCK KEYLINE
XMTR 4 INTERLOCK KEYLINE
ANTENNA COUPLER 1A1 (CHANNEL 1)
ANTENNA COUPLER 1A2 (CHANNEL 2)
ANTENNA COUPLER 1A3 (CHANNEL 3)
ANTENNA COUPLER 1A4 (CHANNEL 4)
ANTENNA GFE
POWER ATTENUATOR A6A
TUNE REFLECTOMETER A6A6
DS2 ALARM
POWER SUPPLY PANEL 1A5
SILENCER
REMOTE ALARM SILENCER
COMBINER FOR ANTENNA COUPLER GROUP AN/SRA-56 ONLY
IMPEDANCE MATCHING NETWORK CU-1773/SRA-56
(USED WITH TWO ANTENNA COUPLER GROUPS AN/SRA-56 TO FORM AN 8-CHANNEL CONFIGURATION)
COMBINER FOR ANTENNA COUPLER GROUP AN/SRA-57 ONLY
STRAP OUT NETWORK FOR 8 CHANNEL OPERATION
IMPEDANCE MATCHING NETWORK CU-1775/SRA-57
(USED WITH TWO ANTENNA COUPLER GROUPS AN/SRA-57 TO FORM AN 8-CHANNEL CONFIGURATION)

Figure 5-50 Antenna Coupler Groups AN/SRA-56, AN/SRA-57, AN/SRA-58, Schematic Diagram

SECTION 6

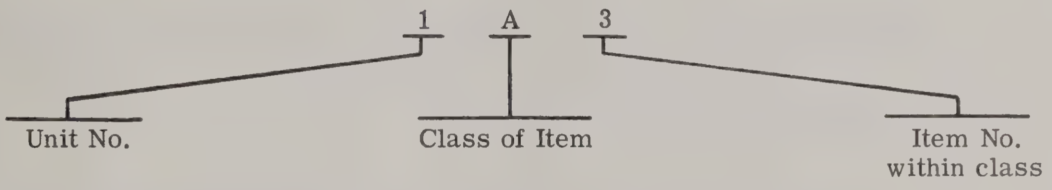
PARTS LIST

6.1 INTRODUCTION

6.1.1 Reference Designations

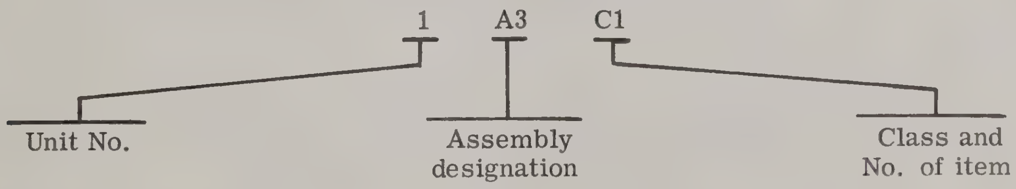
The unit numbering method of assigning reference designations has been used to identify units, assemblies, subassemblies, and parts. This method has been expanded as required to cover the various degrees of subdivision of the equipment. Typical examples of the unit numbering method are illustrated by the following:

Example 1:


1
A
3
Unit No.
Class of Item
Item No.
within class

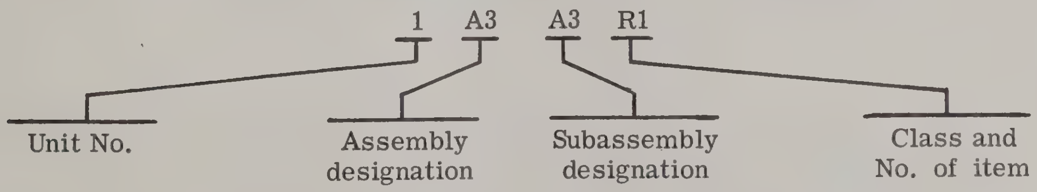
Read as: Third (3) assembly (A) of first unit (1).

Example 2:


1
A3
C1
Unit No.
Assembly
designation
Class and
No. of item

Read as First (1) capacitor (C) of third (3) assembly (A) of first (1) unit.

Example 3:


1
A3
A3
R1
Unit No.
Assembly
designation
Subassembly
designation
Class and
No. of item

Read as: First (1) resistor (R) of third (3) subassembly (A) of third (3) assembly (A) of first (1) unit.

6.1.2 Reference Designation Prefix

Partial reference designations are used on the equipment and illustrations. The partial reference designations consist of the class letter(s) and the identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Prefixes are provided on illustrations following the notation "REF DESIG PREFIX."

6.2 LIST OF UNITS

Table 6-1 is a listing of the units for the equipment covered by this manual. The location of a part within a given unit is defined by the use of notes as specified in paragraph 6.6. Table 6-1 also provides the following information for each unit listed: (1) official name, (2) designation, (3) colloquial name, and (4) location of the first page of its parts listing in Table 6-2.

6.3 MAINTENANCE PARTS LIST

Table 6-2 lists all units and their maintenance parts. Maintenance parts for each unit are listed alpha-numerically by class of part following the unit designation. Table 6-2 provides the following information: (1) the complete reference designation of each unit, assembly, subassembly, or part; (2) reference to explanatory notes in paragraph 6.6; (3) noun name and brief description; and (4) identification of the illustration which pictorially locates the part.

Major assemblies or modules are listed first as individual items in the maintenance parts list. In addition, at the completion of a parts listing for each unit, the individual major assembly, or module, is then broken down by components into separate parts listings. When there is a redundancy of such electronic components or subassemblies in subsequent assemblies, reference is made to the parts breakdown previously listed.

A brief description is given for all key parts (parts differing from any parts previously listed in this table) and sub-key parts (parts identical to a key part but appearing for the first time for a unit). The names and descriptions are omitted for other parts, but reference is made to the key or sub-key part for the data. Unless otherwise indicated, all drawing numbers apply to equipment manufacturer and all model numbers apply to part manufacturer.

6.4 LIST OF MANUFACTURERS

Table 6-3 lists the manufacturers of parts used in the equipment. The table includes the manufacturer's code used in Table 6-2 to identify the manufacturers.

6.5 STOCK NUMBER IDENTIFICATION

An Allowance Parts List (APL), as issued by the Electronics Supply Office (ESO), will include Federal Stock Numbers and Source, Maintenance, and Recoverability Codes. Therefore, reference should be made to the APL prepared for the equipment for stock-numbering information.

6.6 NOTES

The following notes provide additional information concerning the items listed in Table 6-2. Because of the similarity between coupler groups, the listings will reference notes 1, 2, 3, 4, or 5. The definitions of the notes are as follows:

1. Listing applies to Antenna Coupler Group AN/SRA-56

2. Listing applies to Antenna Coupler Group AN/SRA-57

3. Listing applies to Antenna Coupler Group AN/SRA-58

4. Listing applies to Impedance Matching Network CU-1773/SRA-56

5. Listing applies to Impedance Matching Network CU-1775/SRA-57

TABLE 6-1. LIST OF UNITS

UNIT No.	NAME OF UNIT	DESIGNATION	COLLOQUIAL NAME	PAGE NO.
1	Antenna Coupler Group	AN/SRA-56	Coupler Group	6-3
1	Antenna Coupler Group	AN/SRA-57	Coupler Group	6-3
1	Antenna Coupler Group	AN/SRA-58	Coupler Group	6-3
1	Impedance Matching Network	CU-1773/SRA-56	2-6 mc Impedance Matching Network	6-3
1	Impedance Matching Network	CU-1775/SRA-57	4-12 mc Impedance Matching Network	6-4

TABLE 6-2. MAINTENANCE PARTS LIST

ANTENNA COUPLER GROUPS AN/SRA-56, AN/SRA-57, and AN/SRA-58

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1	1	ANTENNA COUPLER GROUP AN/SRA-56: Operates in 2- to 6-mc frequency range; Includes 1 Electrical Equipment Cabinet, type CY-6422/SRA-56; 4 Antenna Couplers, type CU-1772/SRA-56; 1 Power Supply PP-4993/SRA; 5 Reflectometers; 1 RF Relay; and 1 Power Attenuator: mfr 22729. dwg 13E0110H01.	1-1
1	2	ANTENNA COUPLER GROUP AN/SRA-57: Operates in 4- to 12-mc frequency range; Includes 1 Electrical Equipment Cabinet, type CY-6423/SRA-57; 4 Antenna Couplers, type CU-1774/SRA-57; 1 Power Supply PP-4993/SRA; 5 Reflectometers; 1 RF Relay; and 1 Power Attenuator; mfr 22729, dwg 13E0120H01.	1-1
1	3	ANTENNA COUPLER GROUP AN/SRA-58: Operates in 10- to 30-mc frequency range; Includes 1 Electrical Equipment Cabinet, type CY-6424/SRA-58; 4 Antenna Couplers CU-1776/SRA-58; 1 Power Supply PP-4993/SRA; 5 Reflectometers; 1 RF Relay; and 1 Power Attenuator; mfr 22729, dwg 13E0130H01.	1-1
1	4	IMPEDANCE MATCHING NETWORK CU-1773/SRA-56: Operates in the 2- to 6-mc frequency range to combine 2 Antenna Coupler Groups AN/SRA-56 for 8-channel operation; Includes an LC Filter Network; mfr 22729, dwg 13E0332H01.	5-40

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1	5	IMPEDANCE MATCHING NETWORK CU-1775/SRA-57: Operates in the 4- to 12-mc frequency range to combine 2 Antenna Coupler Groups AN/SRA-57 for 8-channel operation; Includes an LC Filter Network; mfr 22729, dwg 13E0313H01.	5-40

ANTENNA COUPLERS CU-1772/SRA-56, CU-1774/SRA-57, AND CU-1776/SRA-58

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1	1	ANTENNA COUPLER: type CU-1772/SRA-56: Operates in the 2-6 mc frequency range, mfr 22729, dwg 13E0052H01.	1-1, 3-2
1A1	2	ANTENNA COUPLER; type CU-1774/SRA-57: Operates in the 4-12 mc frequency range, mfr 22729, dwg 13E0062H01.	1-1, 3-2
1A1	3	ANTENNA COUPLER; type CU-1776/SRA-58: Operates in the 10-30 mc frequency range; mfr 22729, dwg 13E0072H01.	1-1, 3-2
1A1B1	1,2,3	FAN, CENTRIFUGAL: mfr 81349, type FP1T6CA0011A1.	5-30
1A1B1J1	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: 3 pin miniature connector, mfr 96906, type MS3112E8-4P.	5-30
1A1C1	1,2,3	CAPACITOR, FIXED, MICA: mfr 81349, type CM20B102KN3.	5-30
1A1C2	1,2,3	Same as 1A1C1.	5-30
1A1C3	1	CAPACITOR, VARIABLE, VACUUM: 25 to 1000 pf, 15 kv peak, 125 amps, mfr 22729, dwg 05D0311G01.	5-36
1A1C3	2	CAPACITOR, VARIABLE , VACUUM: 20 to 500 pf, 15 kv peak, 80 amps, mfr 22729, dwg 05D0310G01.	5-36
1A1C3	3	CAPACITOR, VARIABLE, VACUUM: 10 to 300 pf, 15 kv peak, 80 amps, mfr 22729, dwg 05D0312G01.	5-36
1A1C4	1	CAPACITOR, VARIABLE, VACUUM: 25 to 1000 pf, 15 kv peak, 125 amps, mfr 22729, dwg 05D0311G01.	5-36

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1C4	2	CAPACITOR, VARIABLE, VACUUM: 20 to 500 pf, 15 kv peak, 80 amps, mfr 22729, dwg 05D0310G01.	5-36
1A1C4	3	CAPACITOR, VARIABLE, VACUUM: 10 to 300 pf, 15 kv peak, 80 amps, mfr 22729, dwg 05D0312G01.	5-36
1A1C5	1,2,3	Same as 1A1A1C15.	5-36
1A1CR1	1,2,3	SEMICONDUCTOR DEVICE, DIODE: mfr 81349, type 1N645.	5-5
1A1CR2	1,2,3	Same as 1A1CR1.	5-5
1A1DS1	1,2,3	LAMP, INCANDESENT: mfr 96906, MIL type MS-25237-327T.	5-30
1A1DS2	1,2,3	Same as 1A1DS1.	5-30
1A1DS3	1,2,3	Same as 1A1DS1.	5-30
1A1DS4	1,2,3	Same as 1A1DS1.	5-30
1A1E1	1,2,3	ROD, SPARK GAP: mfr 22729, dwg 13B0058G01.	5-36
1A1E2	1,2,3	Same as 1A1E1.	5-36
1A1E3	1,2,3	Same as 1A1E1.	5-36
1A1E4	1,2,3	Same as 1A1E1.	5-36
1A1E5	1,2,3	TERMINAL STUD: mfr 96906, type SE079B01.	5-5
1A1E6	1,2,3	Same as 1A1E5.	5-5
1A1L1	1	LINK, INPUT: 1 turn of 1/4 O.D. x .030 copper wall tube, mfr 22729, dwg 13C0254G01.	5-36
1A1L1	2	LINK, INPUT: 1 turn of 1/4 O.D. x .030 copper tube, mfr 22729, dwg 13C0254G02.	5-36
1A1L1	3	LINK, INPUT: 1 turn of 1/4 O.D. x .030 copper tube, mfr 22729, dwg 13C0254G03.	5-36
1A1L2	1	INDUCTOR ASSEMBLY: 9-1/2 turns of .375 O.D. x .030 copper tube, mfr 22729, dwg 13E0596H01.	5-36

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1L2	2	INDUCTOR ASSEMBLY: 6 turns of .500 O.D. x .040 copper tube, mfr 22729, dwg 13E0597H01.	5-36
1A1L2	3	INDUCTOR ASSEMBLY: 3-1/2 turns of .625 O.D. x .040 copper tube, mfr 22729, dwg 13E0598H01.	5-36
1A1L3	1	INDUCTOR ASSEMBLY: 9-1/2 turns of .375 O.D. x .030 copper tube, mfr 22729, dwg 13E0596H01.	5-36
1A1L3	2	INDUCTOR ASSEMBLY: 6 turns of .500 O.D. x .040 copper tube, mfr 22729, dwg 13E0597H01.	5-36
1A1L3	3	INDUCTOR ASSEMBLY: 3-1/2 turns of .625 O.D. x .040 copper tube, mfr 22729, dwg 13E0598H01.	5-36
1A1M1	1,2,3	WATTMETER: 0 to 1.5 kw scale, 0 to 100 microamps, ±2% tolerance of full scale, 1250 ohms ±10%, mfr 22729, dwg 05D0203H01.	5-30
1A1M2	1,2,3	WATTMETER: 0 to 250 watts scale, 0 to 100 mciro-amps, ±2% tolerance of full scale, 1250 ohms ±10%, mfr 22729, dwg 05D0203H02.	5-30
1A1R1	1,2,3	RESISTOR, FIXED, WIRE WOUND: mfr 81349, type RE65G3320.	5-5
1A1R2	1,2,3	Same as 1A1R1.	5-5
1A1S1	1,2,3	SWITCH, PUSHBUTTON; mfr 22729, dwg 05C0625G01.	5-32
1A1S2	1,2,3	SWITCH, SENSITIVE: mfr 22729, dwg 05C0444G01.	5-5
1A1S3	1,2,3	SWITCH, TOGGLE: mfr 96906, MIL type MS25100-23.	5-30
1A1W1	1,2,3	WIRING MATERIAL: mfr 22729, dwg 13E0654H02.	5-5
1A1W1J1	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 96906, MIL type MS3112E16-26P.	5-5
1A1W1P1	1,2,3	CONNECTOR, PLUG, ELECTRICAL: mfr 96906, MIL type MS3116E8-4S.	5-5
1A1W1XA1	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 81349, type M21097-13-04.	5-5
1A1W2	1,2,3	CABLE ASSEMBLY: mfr 22729, dwg 13D0599H01.	5-5

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1W2J2	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 96906, MIL-type MS35317-507A	5-5
1A1W2P1	1,2,3	CONNECTOR, PLUG, ELECTRICAL: mfr 96906, MIL type MS35315-573B.	5-5
1A1XDS1	1,2,3	LAMPHOLDER: mfr 81349, type LH73LC11GN.	5-30
1A1XDS2	1,2,3	LAMPHOLDER: mfr 81349, type LH73LC11RN.	5-30
1A1XDS3	1,2,3	Same as 1A1XDS2.	5-30
1A1XDS4	1,2,3	Same as 1A1XDS2.	5-30
1A1A1	1,2,3	CIRCUIT BOARD ASSEMBLY CONTROL: Printed circuit board with components assembled for monitor and control operation, mfr 22729, dwg 13D0427H01.	5-5
1A1A1C1	1,2,3	CAPACITOR, FIXED, ELECTRICAL: mfr 81349, type CSR13BF105KL.	5-44
1A1A1C2	1,2,3	Same as 1A1A1C1.	5-44
1A1A1C3	1,2,3	CAPACITOR, FIXED, ELECTRICAL: mfr 81349, type CSR13BF476KL.	5-44
1A1A1C4	1,2,3	CAPACITOR, FIXED, ELECTRICAL: mfr 81349, type CH09A1NC104K.	5-44
1A1A1C5	1,2,3	Same as 1A1A1C1.	5-44
1A1A1C6	1,2,3	Same as 1A1A1C1.	5-44
1A1A1C7	1,2,3	Same as 1A1A1C4.	5-44
1A1A1C8	1,2,3	Same as 1A1A1C1.	5-44
1A1A1C9	1,2,3	CAPACITOR, FIXED, ELECTROLYTIC: mfr 81349, type CSR13BG226KL .	5-44
1A1A1C10	1,2,3	Same as 1A1A1C3.	5-44
1A1A1C11	1,2,3	Same as 1A1A1C3.	5-44
1A1A1C12	1,2,3	CAPACITOR, FIXED, MICA: mfr 81349, type CM-07F103JP3.	5-44

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1AC13	1,2,3	CAPACITOR, FIXED, CERAMIC: mfr 81349, type CK63AW103M.	5-44
1A1A1C14	1,2,3	CAPACITOR, FIXED, CERAMIC: mfr 81349, type CK05CW681K.	5-44
1A1A1C15	1,2,3	CAPACITOR, FIXED, ELECTROLYTIC: mfr 81349, type CSR13G224KL.	5-44
1A1A1CR1	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N645.	5-45
1A1A1CR2	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR3	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR4	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR5	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR6	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR7	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR8	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR9	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR10	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR11	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR12	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR13	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR14	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR15	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR16	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR17	1,2,3	Same as 1A1A1CR1.	5-45
1A1A1CR18	1,2,3	Same as 1A1A1CR1.	5-45

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1A1CR19	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N933.	5-45
1A1A1K1	1,2,3	RELAY, PRINTED CIRCUIT: mfr 81349, type RY4YY4B3P11.	5-45
1A1A1P1	1,2,3	CONNECTOR, PLUG, ELECTRICAL: mfr 81349, type M21097-14-10.	5-45
1A1A1Q1	1,2,3	TRANSISTOR: mfr 81349, type 2N491A.	5-45
1A1A1Q2	1,2,3	TRANSISTOR: mfr 81349, type 2N2324A.	5-45
1A1A1Q3	1,2,3	Same as 1A1A1Q2.	5-45
1A1A1Q4	1,2,3	TRANSISTOR: mfr 81349, type 2N1711.	5-45
1A1A1R1	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF103J.	5-43
1A1A1R2	1,2,3	Same as 1A1A1R1.	5-43
1A1A1R3	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC32GF471J.	5-43
1A1A1R4	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC32GF331J.	5-43
1A1A1R5	1,2,3	Same as 1A1A1R4.	5-43
1A1A1R6	1,2,3	Same as 1A1A1R1.	5-43
1A1A1R7	1,2,3	Same as 1A1A1R1.	5-43
1A1A1R8	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF182J.	5-43
1A1A1R9	1,2,3	Same as 1A1A1R1.	5-43
1A1A1R10	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF152K.	5-43
1A1A1R11	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF105J.	5-43
1A1A1R12	1,2,3	Same as 1A1A1R11.	5-43

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1A1R13	1,2,3	RESISTOR, FIXED COMPOSITE: mfr 81349, type RC20GF473J.	5-43
1A1A1R14	1,2,3	Same as 1A1A1R13.	5-43
1A1A1R15	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC32GF751J.	5-43
1A1A1R16	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF154K.	5-43
1A1A1R17	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF101J.	5-43
1A1A1R18	1,2,3	Same as 1A1A1R8.	5-43
1A1A1R19	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF392K.	5-43
1A1A1R20	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF392K.	5-43
1A1A1R21	1,2,3	RESISTOR, VARIABLE: mfr 81349, type RT22C2P102.	5-43
1A1A1R22	1,2,3	Same as 1A1A1R17.	5-43
1A1A1R23	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF561J.	5-43
1A1A1R24	1,2,3	RESISTOR, FIXED FILM: mfr 81349, type RN70D1212F.	5-43
1A1A1R25	1,2,3	Same as 1A1A1R13.	5-43
1A1A1R26	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC32GF222J.	5-43
1A1A1R27	1,2,3	Same as 1A1A1R23.	5-43
1A1ARTI	1,2,3	THERMISTOR: mfr 22729, dwg. 05C0530G01	5-45
1A1A1TP1	1,2,3	JACK, PRINTED CIRCUIT: Block printed circuit test jack, nylon insulator, gold over silver plated beryllium copper contact, mfr 22729, dwg 05C0529G01.	5-45
1A1A1TP2	1,2,3	Same as 1A1A1TP1.	5-45
1A1A1TP3	1,2,3	Same as 1A1A1TP1.	5-45

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1A1TP4	1,2,3	Same as 1A1A1TP1.	5-45
1A1A1VR1	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N3028B.	5-45
1A1A1VR2	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N750A.	5-45
1A1A2	1,2,3	VOLTAGE SENSING PROBE: Consist of resistors, capacitors, a diode and metal probe housed in a metal case, mfr 22729, dwg 13D0239H02.	5-5
1A1A2C2	1,2,3	CAPACITOR, FIXED, CERAMIC: mfr 81349, type CK62BX102K.	5-6
1A1A2C3	1,2,3	Same as 1A1A2C2.	5-6
1A1A2CR1	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N933.	5-6
1A1A2E1	1,2,3	TERMINAL, FEEDTHRU: mfr 81349, type FT049B01.	5-6
1A1A2E2	1,2,3	Same as 1A1A2E1.	5-6
1A1A2E3	1,2,3	GROUND LUG: mfr 96906, type MS77066/2.	5-6
1A1A2E4	1,2,3	Same as 1A1A2E1.	5-6
1A1A2R1	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC20GF183J.	5-6
1A1A2R2	1,2,3	RESISTOR, VARIABLE: mfr 81349, type RV6LAYS-A254A.	5-6
1A1A3	1,2,3	Same as 1A1A2.	5-5, 5-6
1A1A4	1	ELECTRONIC "Q" CONTROL: Inductor-capacitor network enclosed in a metal case, 2-6 mc frequency range, mfr 22729, dwg 13D0282H01.	5-31
1A1A4	2	ELECTRONIC "Q" CONTROL: Inductor-capacitor network enclosed in a metal case, 4-12 mc frequency range, mfr 22729, dwg 13D0347H01.	5-31
1A1A4	3	ELECTRONIC "Q" CONTROL: Inductor-capacitor network enclosed in a metal case, 10-30 mc frequency range, mfr 22729, dwg 13D0347H01.	5-31

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1A4C1	1,2	CAPACITOR, FIXED, CERAMIC: 100 pf ±10% 5000 vdcw, mfr 22729, dwg 05C0440G02.	5-33, 5-34
1A1A4C1	3	CAPACITOR, 37.5 PF: 37.5 pf ±10%, glass cloth epoxy resin sheet dielectric, .016 thick cold rolled copper strip, mfr 22729, dwg 13C0305H01.	5-35
1A1A4C2	1	CAPACITOR, FIXED, CERAMIC: 100 pf ±10%, 5000 vdcw, mfr 22729, dwg 05C0440G02.	5-33
1A1A4C2	2	CAPACITOR, FIXED, CERAMIC: 500 pf ±10%, 5000 vdcw, mfr 22729, dwg 05C0440G01.	5-34
1A1A4C2	3	CAPACITOR, FIXED, CERAMIC: 100 pf ±10%, 5000 vdcw, mfr 22729, dwg 05C0440G07.	5-35
1A1A4C3	1	CAPACITOR, FIXED, CERAMIC: 1000 pf ±10%, 5000 vdcw, mfr 22729, dwg 05C0440G02.	5-33
1A1A4C3	2	CAPACITOR, FIXED, CERAMIC: 50 pf ±10%, 7500 vdcw, mfr 22729, dwg 05C0440G05.	5-34
1A1A4C3	3	CAPACITOR, FIXED, CERAMIC: 75 pf ±10%, 7500 vdcw, mfr 22729, dwg 05C0440G06.	5-35
1A1A4C4	1,2,3	Same as 1A1A4C3.	5-33, 5-34 5-35
1A1A4C5	1,3	Same as 1A1A4C4.	5-33, 5-35
1A1A4C6	1	CAPACITOR, FIXED, CERAMIC: 100 pf ±10%, 5000 vdcw, mfr 22729, dwg 05C0440G07.	5-33
1A1A4J1	1,2,3	CONNECTOR, RECEPTACLE ELECTRIC: mfr 96906, MIL type MS35323-569A.	5-33, 5-34 5-35
1A1A4L1	1	COIL ASSEMBLY: 2.3 microhenry, 11 turns of .125 O.D x .030 thick copper tube on polypropylene coil form, mfr 22729, dwg 13C0283H01.	5-33
1A1A4L1	2	COIL ASSEMBLY: 1.38 microhenry, 8 turn of .125 O.D x .030 thick copper tube on polypropylene coil form, mfr 22729, dwg 13C0283H02.	5-34
1A1A4L1	3	COIL ASSEMBLY: 0.52 microhenry, 12 turns of No. 10 AWG magnetic electrical wire class 105, type T2 per MIL-W-583, mfr 22729, dwg 13C0303H01.	5-35

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A1A5	1,2,3	SHORTING ARM ASSEMBLY: mfr 22729, dwg 13C0080H01.	5-5, 5-36
1A1A5K1	1,2,3	SOLENOID-MODIFIED: mfr 22729, dwg 13B0079G02.	5-5
1A1A6S1S2	1,2,3	SWITCH ROTARY: 3 deck switch, 28 vdc, 5 amps, 2 poles per deck, 5 positions per pole, 1 pushbutton switch to function between positions 4 and 5, decks 1 and 2 make before break, deck 3 break before make, mfr 22729, dwg 05C0202G01.	5-30
1A2	1	Same as 1A1, Note 1.	1-1, 3-2
1A2	2	Same as 1A1, Note 2.	1-1, 3-2
1A2	3	Same as 1A1, Note 3.	1-1, 3-2
1A3	1	Same as 1A1, Note 1.	1-1, 3-2
1A3	2	Same as 1A1, Note 2.	1-1, 3-2
1A3	3	Same as 1A1, Note 3.	1-1, 3-2
1A4	1	Same as 1A1, Note 1.	1-1, 3-2
1A4	2	Same as 1A1, Note 2.	1-1, 3-2
1A4	3	Same as 1A1, Note 3.	1-1, 3-2
	1,2,3	SHAFT: mfr 22729, dwg 13C0582H01.	5-31
	1,2,3	ARM, IDLER: mfr 22729, dwg 13B0664G01.	5-31
	1,2,3	CHAIN, BEAD: mfr 22729, dwg 13C0674G02.	5-31
	1,2,3	SPROCKET, 12 SOCKET: mfr 22729, dwg 05C0588G01.	5-31
	1,2,3	SPROCKET, CHAIN 45 TEETH: mfr 22729, dwg 05C0631G02.	
	1,2,3	SPROCKET, 60 SOCKET: mfr 22729, dwg. 05C0588G11.	5-31
	1,2,3	COUNTER: mfr 22729, dwg 05C0132G01.	5-31
	1,2,3	HOUSING, DRIVE ASSY: mfr 22729, dwg 13D0229H01.	5-31

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
	1,2,3	DRIVE SHAFT ASSY: mfr 22729, dwg 13C0340H01.	5-31
	1,2,3	SPROCKET SHAFT ASSY: mfr 22729, dwg 13C0341H01.	5-31
	1,2,3	GEAR, SPUR: diametral pitch 48; face width 1/4, pressure angle 20 degrees, pitch diameter 1.000, outside diameter 1.042, number of teeth 48, AGMA quality class 8, backlash designation B, mfr 22729, dwg 13C0325G01.	5-31
	1,2,3	DRIVE SHAFT ASSY: mfr 22729, dwg 13C0340H02	5-31
	1,2,3	DRIVE SHAFT ASSY: mfr 22729, dwg 13C0340H03	5-31
	1,2,3	SPROCKET, TAPE: mfr 22729, dwg 05D0503G01	5-31
	1,2,3	SPOOL, TAPE: mfr 22729, dwg 05C0504G02	5-31
	1,2,3	FILTER, AIR: mfr 22729, dwg 05C0482G01	5-31

POWER SUPPLY ASSEMBLY PP-4993/SRA

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A5	1,2,3	POWER SUPPLY ASSEMBLY PP-4993/SRA: Provides 115 vac and +35 vdc for use by the antenna coupler drawers, audible alarm, primary power switch, blown fuse indicators, mfr 22729, dwg 13E0204H01.	1-1, 3-1
1A5DS1	1,2,3	LAMP, GLOW: mfr 96906, MIL type MS25252-NE2D.	5-23
1A5DS2	1,2,3	ALARM, AUDIBLE: 2800 cps output tone ±300 cps, 80 db level, 28 vdc, 14 ma, mfr 22729, dwg 05C0346G01.	5-23
1A5F1	1,2,3	FUSE, CARTRIDGE: mfr 81349, type F02A250V3A.	5-23
1A5F2	1,2,3	Same as 1A5F1.	5-23
1A5F3	1,2,3	Same as 1A5F1.	5-23
1A5F4	1,2,3	Same as 1A5F1.	5-23

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A5F5	1,2,3	Same as 1A5F1.	5-23
1A5F6	1,2,3	Same as 1A5F1.	5-23
1A5F7	1,2,3	Same as 1A5F1. (Spare)	5-23
1A5F8	1,2,3	Same as 1A5F1. (Spare)	5-23
1A5S1	1,2,3	SWITCH, TOGGLE: mfr 96906, MIL type MS25100-22.	5-23
1A5S2	1,2,3	SWITCH, PUSHBUTTON: mfr 81349, type M8805-3-030.	5-23
1A5XDS1	1,2,3	LAMPHOLDER: mfr 81349, type LH74LC13YN.	5-23
1A5XF1	1,2,3	FUSEHOLDER: mfr 81349, type FHL17G2.	5-23
1A5XF2	1,2,3	Same as 1A5XF1.	5-23
SPARE	1,2,3	Same as 1A5XF1.	5-23
1A5XF3	1,2,3	FUSEHOLDER: mfr 81349, type FHL18G2-3.	5-23
1A5XF4	1,2,3	Same as 1A5XF3.	5-23
1A5XF5	1,2,3	Same as 1A5XF3.	5-23
1A5XF6	1,2,3	Same as 1A5XF3.	5-23
SPARE	1,2,3	Same as 1A5XF3.	5-23
1A5A1	1,2,3	CHASSIS ASSEMBLY POWER SUPPLY: mfr 22729, dwg 13E0206H01.	5-23
1A5A1C1	1,2,3	CAPACITOR, FIXED, ELECTROLYTIC: mfr 81349, type CE71C562G.	5-23
1A5A1CR1	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N1202.	5-23
1A5A1CR2	1,2,3	Same as 1A5A1CR1.	5-23
1A5A1CR3	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N645.	5-23

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A5A1J1	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 96906, MIL type MS3112E14-19P.	5-23
1A5A1K1	1,2,3	RELAY ELECTRICAL: mfr 81349, type M5757-9-001.	5-23
1A5A1R1	1,2,3	RESISTOR, FIXED, WIRE WOUND: mfr 81349, type RE65G3320.	5-23
1A5A1R2	1,2,3	RESISTOR, FIXED, COMPOSITION: mfr 81349, type RC20GF561J.	5-23
1A5A1T1	1,2,3	TRANSFORMER: Primary - 115 vac ±5%, 60 cps ±5%, single phase, secondary 35 vdc at 4 amps, 5 tops, mfr 22729, dwg 05D0402G01.	5-23

ELECTRICAL EQUIPMENT CABINETS CY-6422/SRA-56, CY-6423/SRA-57 and CY-6424/SRA-58

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6	1	CABINET ELECTRICAL EQUIPMENT CY-6422/SRA-56: mfr 22729, dwg 13E0053H01.	5-37
1A6	2	CABINET ELECTRICAL EQUIPMENT CY-6423/SRA-57: mfr 22729, dwg 13E0065H01.	5-38
1A6	3	CABINET ELECTRICAL EQUIPMENT CY-6424/SRA-58: mfr 22729, dwg 13E0075H01.	5-39
1A6C1	1,2,3	CAPACITOR, FIXED, PAPER: mfr 81349, type CP53B1EF205K1.	5-28
1A6C2	1,2,3	Same as 1A6C1.	5-28
1A6C3	1,2,3	Same as 1A6C1.	5-28
1A6C4	1,2,3	Same as 1A6C1.	5-28
1A6C5	1	CAPACITOR, FIXED, VACUUM: 500 pf, 15 kv peak, 42 amps, mfr 22729, dwg 05D0405G06.	5-37
1A6C5	2	CAPACITOR, FIXED, VACUUM: 200 pf, 10 kv peak, 60 amps, mfr 22729, dwg 05D0507G01.	5-38
1A6C5	3	CAPACITOR, FIXED, VACUUM: 250 pf, 20 kv peak, 60 amps, mfr 22729, dwg 05D0507G02.	5-39

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6C6	3	CAPACITOR, FIXED, VACUUM: 100 pf, 20 kv peak, 60 amps, mfr 22729, dwg 05D0507G03.	5-39
1A6FL1	1,2,3	FILTER, RF: Electrical rating of 120 vac, 60 cps, 5 amps, 80 db loss at 150 kc to 1000 mc, mfr 22729, dwg 05D0235G01.	5-28
1A6J1	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 96906, MIL type MS91610-352B.	5-24, 5-25 5-26
1A6L1	1,2	CONDUCTOR LOOP ASSEMBLY: mfr 22729, dwg 13C0408H01.	5-37, 5-38
1A6L1	3	CONDUCTOR LOOP ASSEMBLY: mfr 22729, dwg 13C0408H02.	5-39
1A6L2	1,2	CONDUCTOR LOOP ASSEMBLY: mfr 22729, dwg 13C0408H01.	5-37, 5-38
1A6L2	3	CONDUCTOR LOOP ASSEMBLY: mfr 22729, dwg 13C0408H02.	5-39
1A6L3	1,2	CONDUCTOR, LOOP ASSEMBLY: mfr 22729, dwg 13C0408H01.	5-37, 5-38
1A6L3	3	CONDUCTOR, LOOP ASSEMBLY: mfr 22729, dwg 13C0408H02.	5-39
1A6L4	1,2	CONDUCTOR, LOOP ASSEMBLY: mfr 22729, dwg 13C0408H01.	5-37, 5-38
1A6L4	3	CONDUCTOR, LOOP ASSEMBLY: mfr 22729, dwg 13C0408H02.	5-39
1A6L5	2	CONDUCTOR, LOOP ASSEMBLY: 1.0 microhenry inductor, material - 7 turns of 1/4 O.D. x .035 copper tube, mfr 22729, dwg 13D0442G01.	5-38
1A6L5	3	INDUCTOR: 0.32 microhenry, material - 3 turns of 1/4 O.D. x .038 copper tube, mfr 22729, dwg 13C0464G01.	5-39
1A6S1	1,2,3	SWITCH ASSEMBLY, INTERLOCK: mfr 96909, MIL type MS16106-1.	5-37, 5-38 5-39
1A6S2	1,2,3	Same as 1A6S1.	5-37, 5-38 5-39

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6S3	1,2,3	Same as 1A6S1.	5-37, 5-38 5-39
1A6S4	1,2,3	Same as 1A6S1.	5-37, 5-38 5-39
1A6S5	1,2,3	SWITCH ASSEMBLY, INTERLOCK: mfr 96909, MIL type MS16106-5.	5-28
1A6TB1	1,2,3	TERMINAL BOARD: mfr 81349, type 37TB-20.	5-28
1A6TB2	1,2,3	Same as 1A6TB1.	5-28
1A6TB3	1,2,3	Same as 1A6TB1.	5-28
1A6W1P1	1,2,3	CONNECTOR, PLUG, ELECTRICAL: mfr 96906, MIL type MS3116F16-26S.	5-37, 5-38 5-39
1A6W1P2	1,2,3	Same as 1A6W1P1.	5-37, 5-38 5-39
1A6W1P3	1,2,3	Same as 1A6W1P1.	5-37, 5-38 5-39
1A6W1P4	1,2,3	Same as 1A6W1P1.	5-37, 5-38 5-39
1A6W1P5	1,2,3	CONNECTOR, PLUG, ELECTRICAL: 9 pin rectangular miniature, mfr 22729, dwg 05D0610G02.	5-28
1A6W1P6	1,2,3	Same as 1A6W1P5.	5-28
1A6W1P7	1,2,3	Same as 1A6W1P5.	5-28
1A6W1P8	1,2,3	Same as 1A6W1P5.	5-28
1A6W1P9	1,2,3	Same as 1A6W1P5.	5-28
1A6W1P10	1,2,3	CONNECTOR, PLUG, ELECTRICAL: 9 pin rectangular miniature, modified, mfr 22729, dwg 13D0723G02.	5-28
1A6W1P11	1,2,3	CONNECTOR, PLUG, ELECTRICAL: mfr 96906, MIL type MS3116F14-19S.	5-28
1A6W2	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H02.	5-37, 5-38 5-39
1A6W2P1	1,2,3	CONNECTOR, PLUG, ELECTRICAL: mfr 81349, type UG573B/U.	5-28

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6W2P2	1,2,3	CONNECTOR, PLUG, ELECTRICAL: mfr 81349, type UG573B/U.	5-37, 5-38 5-39
1A6W3	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H03.	5-37, 5-38 5-39
1A6W3P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W3P2	1,2,3	Same as 1A6W2P1.	5-37, 5-38 5-39
1A6W4	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H04.	5-37, 5-38 5-39
1A6W4P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W4P2	1,2,3	Same as 1A6W2P1.	5-37, 5-38 5-39
1A6W5	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H05.	5-37, 5-38 5-39
1A6W5P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W5P2	1,2,3	Same as 1A6W2P1.	5-37, 5-38 5-39
1A6W6	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H06.	5-28
1A6W6P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W6P2	1,2,3	Same as 1A6W2P1.	5-28
1A6W7	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H07.	5-28
1A6W7P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W7P2	1,2,3	Same as 1A6W2P1.	5-28
1A6W8	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H08.	5-28
1A6W8P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W8P2	1,2,3	Same as 1A6W2P1.	5-28
1A6W9	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H09.	5-28

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6W9P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W9P2	1,2,3	Same as 1A6W2P1.	5-28
1A6W10	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H10.	5-37, 5-38 5-39
1A6W10P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W10P2	1,2,3	Same as 1A6W2P1.	5-37, 5-38 5-39
1A6W11	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H11.	5-38
1A6W11P1	1,2,3	Same as 1A6W2P1.	5-28
1A6W11P2	1,2,3	Same as 1A6W2P1.	5-28
1A6W12	1,2,3	CABLE ASSEMBLY: RG-213/U coax with UG573B/U connectors on each end, mfr 22729, dwg 13D0599H12.	5-37, 5-38 5-39
1A6W12P1	1,2,3	Same as 1A6W2P1.	5-37, 5-38 5-39
1A6W12P2	1,2,3	Same as 1A6W2P1.	5-28
1A6A1	1,2,3	POWER ATTENUATOR ASSEMBLY: 1 kw, 50 ohm load to dissipate transmitter power during tuning of one antenna coupler drawer, mfr 22729, dwg 13E0225-H01.	5-24, 5-25 5-26
1A6A1J1	1,2,3	CONNECTOR, RECEPTACLE ELECTRICAL: mfr 96906, MIL type MS35323-569A.	5-24, 5-25 5-26
1A6A1J2	1,2,3	Same as 1A6A1J1.	5-24, 5-25 5-26
1A6A1R1	1,2,3	RESISTOR, POWER: 25 ohms ±10%, 100 w, 4 kv peak, 1 inch diameter by 6 inches long, mfr 22729, dwg 05C0388G01.	5-27
1A6A1R2	1,2,3	Same as 1A6A1R1.	5-27
1A6A1R3	1,2,3	Same as 1A6A1R1	5-27
1A6A1R4	1,2,3	Same as 1A6A1R1.	5-27
1A6A1R5	1,2,3	Same as 1A6A1R1.	5-27
1A6A1R6	1,2,3	Same as 1A6A1R1.	5-27

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6A1R7	1,2,3	Same as 1A6A1R1.	5-27
1A6A1R8	1,2,3	Same as 1A6A1R1.	5-27
1A6A1R9	1,2,3	RESISTOR, POWER: 37.5 ohms ±10%, 100 w 4 kv peak, 1 inch diameter by 6 inches long, mfr 22729, dwg 05C0388G02.	5-27
1A6A2	1,2,3	REFLECTOMETER ASSEMBLY: Voltage sensing and rectifying network enclosed in a metal case, 1 transformer, 2 diodes, 5 resistors, 11 capacitors, mfr 22729, dwg 13D0261H01.	5-28
1A6A2C1C2	1,2,3	CAPACITOR, SPECIAL: 2 capacitors, 0.8 pf ±10% each, teflon dielectric, copper tube and brass rod plates, mfr 22729, dwg 13C0200H01.	5-18
1A6A2C3	1,2,3	CAPACITOR, FIXED, MICA: mfr 81349, type CM05DC470JP3.	5-18
1A6A2C4	1,2,3	Same as 1A6A2C3.	5-18
1A6A2J1	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: mfr 96906, MIL type MS35323-569A.	5-18
1A6A2J2	1,2,3	Same as 1A6A2J1.	5-18
1A6A2J3	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: 9 pin rectangular miniature, mfr 22729, dwg 05D0610G01.	5-18
1A6A2R1	1,2,3	RESISTOR, FIXED, COMPOSITE: mfr 81349, type RC32GF100J.	5-18
1A6A2R2	1,2,3	Same as 1A6A2R1.	5-18
1A6A2T1	1,2,3	TRANSFORMER ASSEMBLY: Ferrite torroid core, 2 windings of 14 turns of magnetic electrical wire AWG No. 26, threaded brass shaft, epoxy resin insulation, mfr 22729, dwg 13D0216H01.	5-18
1A6A2A1	1,2,3	PRINTED WIRING ASSEMBLY: mfr 22729, dwg 13D0086H01.	5-18
1A6A2A1CR1	1,2,3	SEMICONDUCTOR DEVICE, DIODE: mfr 81349, type 1N3604.	5-18

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6A2A1C1	1,2,3	CAPACITOR, FIXED, MICA: mfr 81349, type CM05DCA70JP3.	5-18
1A6A2A1C2	1,2,3	CAPACITOR, VARIABLE: mfr 81349, type CV11C450.	5-18
1A6A2A1R1	1,2,3	RESISTOR, FIXED, COMPOSITION: mfr 81349, type RC20GF393J.	5-18
1A6A2A2	1,2,3	PRINTED WIRING ASSEMBLY: mfr 22729, dwg 13D0084H01.	5-18
1A6A2A2CR1	1,2,3	Same as 1A6A2A1CR1.	5-18
1A6A2A2C1	1,2,3	CAPACITOR, FIXED, MICA: mfr 81349, type CM05DC390JP3.	5-18
1A6A2A2C2	1,2,3	Same as 1A6A2A1C2.	5-18
1A6A2A2C3	1,2,3	CAPACITOR, FIXED, CERAMIC: mfr 81349, type CK62AW472M.	5-18
1A6A2A2C4	1,2,3	Same as 1A6A2A2C3.	5-18
1A6A2A2C5	1,2,3	Same as 1A6A2A2C3.	5-18
1A6A2A2L1	1,2,3	COIL, RF: mfr 96906, MIL type MS75055-2.	5-18
1A6A2A2R1	1,2,3	RESISTOR, VARIABLE: mfr 81349, type RT22C-2W103.	5-18
1A6A2A2R2	1,2,3	RESISTOR, VARIABLE: mfr 81349, type RT22C2W502.	5-18
1A6A3	1,2,3	Same as 1A6A2.	5-18, 5-28
1A6A4	1,2,3	Same as 1A6A2.	5-18, 5-28
1A6A5	1,2,3	Same as 1A6A2.	5-18, 5-28
1A6A6	1,2,3	REFLECTOMETER ASSEMBLY (TUNE): Voltage sensing and rectifying network enclosied in a metal case, mfr 22729, dwg 13D0261H02.	5-28
1A6A6C1C2	1,2,3	Same as 1A6A2C1C2.	5-19
1A6A6C3	1,2,3	Same as 1A6A2C3.	5-19
1A6A6C4	1,2,3	Same as 1A6A2C3.	5-19

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

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1A6A6J1	1,2,3	Same as 1A6A2J1.	5-19
1A6A6J2	1,2,3	Same as 1A6A2J1.	5-19
1A6A6J3	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: 9 pin rectangular miniature, mfr 22729, dwg 13D0723H01.	5-19
1A6A6R1	1,2,3	Same as 1A6A2R1.	5-19
1A6A6R2	1,2,3	Same as 1A6A2R1.	5-19
1A6A6T1	1,2,3	Same as 1A6A2T1.	5-19
1A6A6A1	1,2,3	PRINTED WIRING ASSEMBLY: mfr 22729, dwg 13D0732H01.	5-19
1A6A6A1CR1	1,2,3	SEMICONDUCTOR, DEVICE, DIODE: mfr 81349, type 1N270.	5-19
1A6A6A1CR2	1,2,3	Same as 1A6A6A1CR1.	5-19
1A6A6A1C1	1,2,3	Same as 1A6A2A2C1.	5-19
1A6A6A1C2	1,2,3	Same as 1A6A2A1C2.	5-19
1A6A6A1C3	1,2,3	Same as 1A6A2A2C3.	5-19
1A6A6A1C4	1,2,3	Same as 1A6A2A2C3.	5-19
1A6A6A1L1	1,2,3	Same as 1A6A2A2L1.	5-19
1A6A6A1Q1	1,2,3	TRANSISTOR: mfr 81349, type 2N1308.	5-19
1A6A7	1,2,3	RF RELAY ASSEMBLY: 8 rf relays, 10 coaxial connectors, 1 eight pin connector, mounted in metal case, mfr 22729, dwg 13E0196H01.	5-28
1A6A7CR1	1,2,3	Same as 1A1CR1.	5-29
1A6A7CR2	1,2,3	Same as 1A1CR1.	5-29
1A6A7CR3	1,2,3	Same as 1A1CR1.	5-29
1A6A7CR4	1,2,3	Same as 1A1CR1.	5-29
1A6A7J1	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J2	1,2,3	Same as 1A6A1J1.	5-29

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

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1A6A7J3	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J4	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J5	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J6	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J7	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J8	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J9	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J10	1,2,3	Same as 1A6A1J1.	5-29
1A6A7J11	1,2,3	CONNECTOR, RECEPTACLE, ELECTRICAL: 9 pin miniature receptacle connector, mfr 22729, dwg 05D0610G01.	5-29
1A6A7K1	1,2,3	RELAY, VACUUM: Coil 26.5 vdc, 1300 ohms, 22 vdc pull in, 1-10 vdc drop out, one set of contacts, 2 kv contact operation, 2-8 amps contact capacity, 3/4 oz., mfr 22729, dwg 05C0442G01.	5-29
1A6A7K2	1,2,3	Same as 1A6A7K1.	5-29
1A6A7K3	1,2,3	Same as 1A6A7K1.	5-29
1A6A7K4	1,2,3	Same as 1A6A7K1.	5-29
1A6A7K5	1,2,3	Same as 1A6A7K1.	5-29
1A6A7K6	1,2,3	Same as 1A6A7K1.	5-29
1A6A7K7	1,2,3	Same as 1A6A7K1.	5-29
1A6A7K8	1,2,3	Same as 1A6A7K1.	5-29

IMPEDANCE MATCHING NETWORK CU-1773/SRA-56, AND CU-1775/SRA-57

1C1	4	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05D0406G01.	5-41
1C1	5	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05D0405G06.	5-42

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

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1C2	4	CAPACITOR, FIXED, VACUUM: 100 pf ±5%, 7.5 kv peak, 42 amps, mfr 22729, dwg 05D0406G01.	5-41
1C2	5	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05D0405G05.	5-42
1C3	4	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05C0507G02.	5-41
1C3	5	Same as 1C1 (Note 4).	5-42
1C4	4	CAPACITOR, FIXED, VACUUM: 500 pf, 10 kv peak, 42 amps, mfr 22729, dwg 05D0405G03.	5-41
1J1	4,5	CONNECTOR, INNER: mfr 22729, dwg 05C0534G01.	5-40
1L1	4	INDUCTOR, RF: 9 turns of 1/4 O.D. x .035 copper tube, mfr 22729, dwg 13D0450H01.	5-41
1L1	5	INDUCTOR, RF: mfr 22729, dwg 13D0422H02.	5-42
1L2	5	INDUCTOR, RF: 0.9 microhenry, material - 7 turns of 1/4 O.D. x .035 copper tube, mfr 22729, dwg 13D0444H01.	5-42
1P1	4,5	PROBE ASSEMBLY: mfr 22729, dwg 13B0429H01.	5-40
1P2	4,5	Same as 1P1.	5-40

TABLE 6-3. LIST OF MANUFACTURERS

MFR. CODE	NAME	ADDRESS
22729	DECO Communications Department, Defense and Space Center, Westinghouse Electric Corporation	Box 551 Leesburg, Virginia 22075
75042	IRC, Inc.	401 North Broad Street Philadelphia, Pennsylvania 19108
81349	Military Specification, Promulgated by Standardization Division, Directorate of Logistics Service DSA.	
96906	Military Standard, Promulgated by Standardization Division, Directorate of Logistics Service DSA.	

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